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**EXPLORATIONS IN CURIOSITY: BREADTH AND DEPTH OF INTEREST
CURIOSITY STYLES**

University of Melbourne (Australia)

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**EXPLORATIONS IN CURIOSITY: BREADTH AND DEPTH
OF INTEREST CURIOSITY STYLES**

Mary D. Ainley

**Submitted in partial fulfilment of the requirements for the degree of
Doctor of Philosophy in the University of Melbourne.**

1985

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ABSTRACT

Examination of the ways in which the term "curiosity" has been used in the research literature indicates that a construct of curiosity subsuming two distinct styles has the potential to integrate what is currently known and also to provide direction for further research. The two styles suggested by review of the literature are breadth of interest curiosity, an orientation towards seeking varied and changing experience, and, depth of interest curiosity, an orientation towards investigating new ideas, events and puzzling phenomena.

The explanations of curiosity behaviour which have been proposed by "optimal arousal" and "cognitive" theorists are evaluated and compared with the explanatory system for complex human motivations offered in "differential emotions theory". It is suggested that differential emotions theory with its emphasis on the role of affective-cognitive structures offers important insights into the processes operating when curiosity is aroused.

To test these proposals a study of the factorial structure of adult curiosity measures was undertaken

and a new scale (the Two Factor Curiosity Scale) developed. Validation studies were undertaken to examine the internal structure of the new scale. It was shown to match the predicted structure and to have sound psychometric properties. The relationships between scores on the Two Factor Curiosity Scale and responses to an occupational interest inventory were explored to determine the construct validity of the scale. In addition, the nature of the two curiosity styles as affective-cognitive structures was investigated through an examination of the pattern of basic emotions reported in situations representing both breadth and depth of interest curiosity. Important similarities and differences were found in the patterns of basic emotions associated with each curiosity style.

The results of these studies confirmed the validity of the two factor formulation of curiosity.

CHAPTER 1

INTRODUCTION

Curiosity: A Persistent Theme in Educational Debate

Whenever educators have directed themselves to statements about the process of education, curiosity is accorded an important place.

In Emile, Rousseau declared:

Man's diverse powers are stirred by the same instinct. The bodily activity, which seeks an outlet for its energies, is succeeded by the mental activity which seeks for knowledge. Children are first restless, then curious; and this curiosity, rightly directed, is the means of development for the age with which we are dealing. Always distinguish between natural and acquired tendencies. There is a zeal for learning which has no other foundation than a wish to appear learned, and there is another which springs from man's natural curiosity about all things far or near which may affect himself.

(Rousseau, 1762/1963, p. 130, Bk. II)

Echoing Rousseau's notion of a natural curiosity, Dewey proclaimed:

We have tendencies that are forward-reaching and out-reaching, that go out to make new contacts, that seek new objects, that strive to vary old objects, that revel as it were, in experiences for their own sake and so are ceaselessly active in enlarging the range of experience. These various tendencies are summed up in curiosity.

(Dewey, 1933, p. 36)

And further he argued:

Training is that development of curiosity, suggestion, and habits of exploring and testing, which increases

sensitiveness to questions and love of inquiry into the puzzling and unknown.

(Dewey, 1933, pp. 55-56)

Alongside such assertions there has always been a caution, sometimes explicitly stated, at other times merely implied, that the child's natural curiosity could be dulled and even extinguished through mishandling.

Rogers in Freedom to learn wrote:

Human beings have a natural potentiality for learning. They are curious about their world, until and unless this curiosity is blunted by their experience in our educational system.

(Rogers, 1969, p. 190)

When outlining proposals for his revolutionary program of graduate education he suggested that the first purpose was:

To provide a situation which will restore stimulate and enhance the unquenchable curiosity which the student has as a small child. Customarily, by the time he reaches graduate school this curiosity has been dulled and blunted into passive conformity.

(Rogers, 1969, p. 190)

This theme is re-iterated in many of the popular educational writings of the sixties and seventies.

We destroy the disinterested (I do not mean uninterested) love of learning in children, which is so strong when they are small, by encouraging and compelling them to work for contemptible rewards... for the ignoble satisfaction that they are better than someone else... We kill not only their curiosity but their feeling that it is a good and admirable thing to be curious, so that by the age of ten most of them will not ask questions, and will show a good deal of scorn for the few who do.

(Holt, 1964/1969, pp. 165-166)

In less emotive language Robinson's (1974) discussion of the Hadow (1931) and Plowden (1966) Reports into primary education, and the Hadow (1926), Spens (1938) and Newsom (1963) Reports into secondary education in Britain, expressed substantially the same themes.

All the reports studied make frequent mention of "interest" and "curiosity", although neither word is ever actually defined; they are assumed to be understood. In their reference to interest and curiosity, the reports concentrate upon the power these have to motivate people to learn. They see the satisfaction of interest and curiosity as the chief intrinsic reward which the learner can achieve. Intrinsic satisfaction is assumed to lead to more effective learning than extrinsic rewards. The reports deal also with the promotion of interest and curiosity as goals of education. They speak of the arousal of new interests and the stimulation of existing ones as being important functions of education.
(Robinson, 1974, pp. 1-2)

Later, when comparing those reports dealing with primary education with those directed to an examination of secondary education, Robinson (1974) noted a marked contrast in the observed levels of children's curiosity, commenting as follows.

The single most alarming difference, which strikes one immediately, is that while the reports on Primary schools speak of the great natural curiosity which children have when they first begin school, the reports on Secondary education stress their boredom in later years at school.
(Robinson, 1974, p. 22)

The Problem

Robinson (1974) observed that the terms "curiosity" and "interest" were never actually defined in the reports. Rather, they were assumed to be understood. A large volume of research literature

has grown up using the construct "curiosity", and after reviewing its findings Maw and Maw (1978) drew the following conclusion.

Among the major needs in curiosity assessment is a better understanding of the issues considered earlier in this chapter. Study is needed to more sharply delineate different kinds of curiosity, as well as to reveal the similarities among the various theories of curiosity. To do this, better ways of validating assessment techniques and instruments must be developed. We need to have more confidence that what we are measuring is indeed curiosity.
(Maw & Maw, 1978, p. 555)

These observations point to the difficulties associated with use of a construct such as "curiosity". In this thesis it is proposed to examine the construct of curiosity, some of the main theories which have attempted to explain its operation, and the forms of measurement which have been used in curiosity research. Particular emphasis is given to identifying those elements which contribute to the development of a fruitful synthesis of current knowledge about human curiosity.

Overview

This thesis is presented in two sections. The first, consisting of Chapters Two-Four, presents a review of prominent descriptive classifications and theories of curiosity. The second section (Chapters Five-Nine) details a number of original empirical investigations into the validity of the two factor construct of curiosity derived from the review presented in Section I.

Chapter Two begins Section I with a review of the substantial

body of literature which has attempted to describe and define curiosity. A wide range of definitions and systems is described, and their different emphases explored and compared. The outcome of this review is the proposal that a construct of curiosity which distinguishes two separate curiosity styles, breadth of interest curiosity and depth of interest curiosity, is able to provide the coherent framework necessary for an integration of the many research strands.

In Chapter Three two of the most influential types of theory of curiosity are outlined and the critical differences between them are examined. Both of these theories, the "optimal arousal" and "cognitive" theories of curiosity, are attempts to delineate those processes operating in situations where curiosity is aroused.

Between these two viewpoints there is a strong measure of agreement over the important stimulus properties which provoke curiosity behaviour. Both characterize the stimulus situation in terms of a level of mismatch between its properties and the individual's expectancies or anticipations. It is argued that the basic difference between the two theories involves the role accorded to "arousal" in determining the direction of behaviour. For the optimal arousal theorist it is the crucial mediating variable; for the cognitive theorist, it is an organic concomitant of information processing.

In order to assess the validity of these viewpoints the experimental evidence purporting to demonstrate the role of arousal as the crucial mediating variable is examined. Three sets of experimental evidence are considered in detail. The first set consists of studies

in which certain stimulus properties are tested for their effects on exploratory behaviour. The second set involves studies attempting to relate those same stimulus properties to changes in arousal. The third set tests the effects of manipulations of arousal level on exploratory behaviour.

The findings of this review prompt the conclusion that the available evidence does not generally substantiate the interpretations drawn from it by the optimal arousal theorists. As explanations for approach to novelty, the difference between the two theories becomes a difference between the motivating effects of "uncertainty" and "incongruity".

A different approach to explaining the bases of curiosity behaviour is contained within the "differential emotions" theory of Izard (1977) of which the important features are detailed in Chapter Four. The critical element in this theory is the treatment of emotion as a general motivational variable, and variables such as curiosity are viewed as "affective-cognitive structures" elaborated from the person's innate emotion processes. The important explanatory constructs in differential emotions theory are described to indicate the degree to which the affective-cognitive structures construct can be used to account for complex motivational and personality dimensions such as curiosity.

Differential emotions theory as a theory of curiosity is then compared with the optimal arousal and cognitive viewpoints. It is suggested that many of the differences between these three theories are differences of emphasis, especially in terms of which variable, or

set of variables, is regarded as critical in directing approach to novelty. The conclusion is drawn that differential emotions theory, with its emphasis on the role of emotions in the elaboration of complex motivational patterns, presents the most comprehensive framework within which the nature of different curiosity styles, and in particular curiosity manifested through breadth of interest and depth of interest, can be explored.

Chapter Five commences Section II with a review of the wide range of assessment forms which have been used for research on curiosity in both children and adults. The structure and content of these measurement forms, together with the particular theoretical viewpoints from which they derive, is examined to determine the nature of the curiosity construct involved, and its relationship to the concepts of breadth and depth of interest curiosity. As part of this scrutiny of the measures, the relationships between scores on the various assessment forms are presented.

Measurement of curiosity in children has employed three main assessment forms: performance measures, teacher ratings, and self-report scales. Construction of these measures has often been pragmatic rather than adhering closely to any particular theoretical system. The outcome of this, most notably in the area of performance measures, has been insufficient attention to qualitative differences between the activities from which the scores derive. Studies examining the relationship between measures of curiosity in children have generally found only very small overlap between those measures.

Measures of curiosity in adults have typically taken the form of

self-report questionnaires, and are more likely to have been developed in an attempt to operationalize the central construct of a particular theoretical system. Most of the scale development research reports have included some indication of how that scale relates to other scales, and from these reports it is possible to draw some conclusions about the constructs underpinning the scales.

The findings from this body of literature on the measurement of curiosity in children and adults does not support the notion of a general factor of curiosity. Rather, a two factor construct distinguishing between breadth of interest and depth of interest components appears to provide a more valid synthesis of the extensive array of measures and findings.

Chapter Six reports the details of a series of studies designed to verify this two factor formulation through an empirical analysis of the structure of existing measurement scales and the development of a new scale which incorporates both breadth of interest and depth of interest dimensions.

Three studies are reported. In the first study a selection of scales which have been used in the assessment of curiosity in adults was administered to a group of teacher education students. Factor analysis of the scores from these scales indicated a two factor solution consistent with the breadth and depth of interest curiosity formulation. The second study reports the development of a new scale designed to measure each of the two factors. This scale was developed by assembling together items from the original scales which correlated most strongly with the breadth and depth factors respectively. The

final study reports the results of a cross-validation in which the new two factor scale was administered to a second group of teacher education students. The scores were again analysed and the results confirmed the predicted two factor structure of the scale. The resulting 40 item scale: the Two Factor Curiosity Scale, was also shown to have sound psychometric properties.

Chapter Seven extends the validation of the internal structure of the Two Factor Curiosity Scale through an analysis of the responses of a group of Year 10 high school students. These students were younger than the groups used in the scale's development and represented a broader range of ability. Similar analyses to those reported in Chapter Six were performed. The results from these analyses indicated the same basic internal structure for the Two Factor Curiosity Scale as was evident in the responses of the groups who participated in the scale's construction. On the basis of these results the conclusion is drawn that the Two Factor Curiosity Scale is a valid test measuring two separate curiosity dimensions: breadth of interest curiosity and depth of interest curiosity.

In Chapter Eight the details of a study designed to assess the construct validity of the Two Factor Curiosity scale by relating the curiosity style scores to scores obtained on a occupational interest inventory, are reported. Discriminant function analyses were used to determine that combination of variables from the occupational interest inventory which maximally discriminated the curiosity style groups. The results of these analyses indicated that across the different indices there was one consistent function which separated the curiosity style groups. Examination of the substantive nature of this

function indicated that the Two Factor Curiosity scale has a high degree of construct validity.

In Chapter Four it was argued that Izard's differential emotions theory (Izard, 1977) presents a theory of motivation which is appropriate for an understanding of the nature of curiosity, and which overcomes some of the difficulties associated with other major theories of curiosity. A study reported in Chapter Nine was designed to explore the patterns of fundamental emotions aroused in situations indicative of breadth of interest curiosity and depth of interest curiosity. Analysis of the patterns of emotion reported by the participants in the study suggested that the affective-cognitive structures operating in both curiosity dimensions are organized around arousal of the positive emotion interest-excitement. Enjoyment-joy and surprise-startle were also aroused but to a lesser extent. In contrast, the pattern of emotions reported in situations indicative of breadth of interest curiosity also implicated the negative emotion fear-terror.

The review of the existing research literature presented in this thesis together with the results of the empirical investigations undertaken, indicate that a construct of curiosity subsuming two distinct styles has the potential to integrate what is currently known about human curiosity, and also to provide direction for further research. The two styles explored in this analysis are breadth of interest curiosity, an orientation towards seeking varied and changing experiences, and depth of interest curiosity, an orientation towards investigating new ideas, events and puzzling phenomena.

SECTION I

THE NATURE OF CURIOSITY:

A review of prominent descriptive classifications
and theories of curiosity.

CHAPTER 2

CURIOSITY: WHAT IS IT?

Overview. In this chapter a review of the substantial body of literature which has attempted to describe and define curiosity is presented. A wide range of definitions and systems are described, their different emphases explored, and compared. The outcome of this review is the proposal that a construct of curiosity which distinguishes two separate curiosity styles, breadth of interest curiosity and depth of interest curiosity, is able to provide the coherent framework necessary for an integration of the many research strands.

Writing in 1965, Fowler commented that curiosity is a behaviour without a definition. Livson (1967) noted that curiosity was a term of varied and sometimes inconsistent meanings:

The very folksy familiarity of the term "curiosity" and the promiscuity of its application - both lay and, recently, scientific - give it a deceptive simplicity. Curiosity, in its conventional usage is many things. A person is curious (a trait among individuals, with presumed stability over time and generality across situations); a situation is curiosity-evoking (a characteristic of the environment triggering certain responses for more or less everyone). One is too busy or too tired to be curious (a motivational state dependent upon, or interacting with, other transitional conditions of the individual) or is just not curious about a particular situation (a motivational state linked with relatively stable individual differences in interests among individuals).

(Livson, 1967, p. 73)

Over the last two decades there has been a significant growth in the volume of literature dealing with curiosity and related constructs. The renewed interest in human curiosity in the sixties and seventies was to a large extent stimulated by research on exploratory

behaviour in infrahuman species (Butler, 1958; Harlow, 1953; Montgomery, 1955). Berlyne (1950, 1954a, 1954b, 1960, 1966, 1978) elaborated a system with curiosity as the motivational variable initiating exploratory behaviour.

We appropriately speak of "curiosity" whenever a person or animal undergoes subjective uncertainty and is, in consequence, impelled to engage in specific exploratory responses.

(Berlyne, 1978, p. 160)

Examination of Berlyne's writings indicates that there was a gradual shift in attention from animal to human exploratory behaviour and an expanded content for the category of exploratory behaviour. This pattern can be detected across the entire range of studies in the area, and can be brought sharply into focus through a consideration of some of the key constructs which appear in Berlyne's prolific writings.

Berlyne: Curiosity and Exploratory Behaviour

There are two major classification schemes which appear in Berlyne's writings. One involves a distinction between exploratory and epistemic behaviour, motivated by perceptual and epistemic curiosity respectively. The second is based on a distinction between specific and diversive exploration motivated in turn by specific curiosity and states related to boredom. Taken chronologically these writings indicate a shift in emphasis whereby the specific/diversive classification comes to take precedence over the exploratory/epistemic

distinction which was a major feature of the earlier writings.

Perceptual and Epistemic Curiosity

Exploratory behaviour is described by Berlyne (1960) as behaviour whose:

principal function, is, in fact, to afford access to environmental information that was not previously available. They do so by intensifying or clarifying stimulation from objects that are already represented in the stimulus field, and thus reducing uncertainty about the properties of those objects, or else by bringing receptors into contact with new stimulus objects....

We shall differentiate between exploratory responses and responses through which knowledge is acquired, although the two may often coincide.

(Berlyne, 1960, pp. 79-80)

"Exploratory" and "epistemic" behaviour are stated to overlap but this is always seen as secondary to the distinction of one being concerned with perception, the other with knowledge; one motivated by "perceptual curiosity", the other by "epistemic curiosity". Accompanying this distinction is the assumption that certain types of stimuli are categorically different, one type involving perceptual activity and the other symbolic activity or knowledge. Experiments exploring perceptual curiosity were designed around stimulus materials in the form of random polygons and incongruous shapes (Berlyne 1957, 1958a, 1963), while those dealing with epistemic curiosity used prose material about invertebrate animals (Berlyne, 1954b) and literary quotations attributed to well-known authors (Berlyne, 1962). In the experiment using incongruous shapes (1957), incongruity was manipulated by putting together stimulus patterns "with characteristics which S has been trained to regard as incompatible" (p. 401), e.g., the head of an elephant on a lion's

body. Responses to such material are drawing on existing symbolic structures and hence involve epistemic curiosity.

The exploratory/epistemic distinction with the associated motivational states of perceptual and epistemic curiosity, all but disappears from Berlyne's later writings where the emphasis is firmly focussed on the specific/diversive exploration classification. Within this classification the term exploratory behaviour has a much broader meaning than was the case in the earlier writings. Berlyne's paper delivered for the Toronto Symposium (Berlyne, 1971) does not mention the distinction between perceptual and epistemic curiosity, and presents a description of brain functioning which includes a much broader notion of the role of symbolic structures in exploratory behaviour than was the case in earlier writings.

The brain is in the business of processing information...

Information processing then means collation. And in the brain, an incoming item of information, whether it is transmitted through sense organs from the outside world or whether it stems from events in the viscera, nervous system, or muscles, is collated with other items that are received at the same time, with other items that have been received in the past, and with other items that might have been received instead.

Collation has two sides, comparison and synthesis. Comparison means responding to relations. At the lowest level, this can mean simply noting identity or difference, match or mismatch. But there can be recognition of a much greater variety of relations... Synthesis means grouping signals together into conjunctions or patterns or structures, which are then treated as unitary supersignals.

(Berlyne, 1971, p. 189)

In his later writings exploration is used to refer to a broader category of behaviour which encompasses what earlier was divided into "exploratory" and "epistemic" behaviour. The term epistemic is not used and the distinction between specific and diversive exploration is

used in the context of intrinsic motivation within an educational setting.

Specific and Diverive Exploration

The distinction between specific and diverive exploration appeared in some of Berlyne's early writings but was usually secondary to the focus on perceptual and epistemic curiosity. He described specific and diverive exploration in the following way:

Specific exploration has the function of providing stimulation from a definite source. No other source will do instead. It is the kind of behaviour that we perform when we are said to be "looking for" or "taking a closer look at" something in particular. Diverive exploration is what in human life goes by such names as "recreation", "entertainment", or "seeking a change". In this case, the function is to secure stimulation with certain structural properties compatible with a large range of content. The source or content of the stimulation does not matter at all as long as it provides the right degree of interest.
(Berlyne, 1963, p. 289)

At the heart of the distinction between the two forms of exploration is the proposition that each is the result of distinct, and different, motivational conditions.

Specific exploration depends on uncertainty and on the conflict that results from uncertainty. This is the kind of motivational condition that I myself would call "curiosity".... Diverive exploration will sometimes occur without any prior predisposition whatever. Something interesting and amusing may be encountered by chance and may reinforce the response that leads up to it. But nevertheless, the propensity for diverive exploration is heightened by a period of sensory deprivation or boredom.
(Berlyne, 1971, pp. 190-191)

For Berlyne then, curiosity is the motivational state arising

from uncertainty and its associated conflict, which initiates specific exploration. The two classifications of exploratory behaviour are orthogonal. The specific/diversive distinction is based on the nature of the motivating conditions, the exploratory/epistemic distinction on a very limited categorization of behavioural content - perception or knowledge. Berlyne's later writings have generally focussed on specific exploration with only minor references to diversive exploration.

Definitions and Systems

Writers who have built on the basic work contributed by Berlyne have modified his framework slightly and extended the "curiosity" construct to include the motivational state which initiates diversive exploration. Leherissey (1971) and Day (1968c) present analyses which include categories of both specific and diversive curiosity. The content of research on curiosity and exploratory behaviour then embraces a much wider range of behaviour. At the same time research directing attention to similar and related forms of behaviour has generated a whole new set of descriptors. Terms such as "sensation seeking", "novelty seeking" and "variation seeking" appear alongside "curiosity" and "exploration" in the research reports of the sixties and early seventies. Such terms have been used variously as interchangeable or distinct terms. This variability and even imprecision of usage is clearly illustrated by instances of the same behaviour having different labels when only the age of the actors has been changed. The Children's Reactive Curiosity Scale (Penney &

McCann, 1964) was designed to measure what is referred to by the authors as "reactive curiosity". It is defined as:

- (1) a tendency to approach and explore relatively new stimulus situations,
- (2) a tendency to approach and explore incongruous, complex stimuli,
- (3) a tendency to vary stimulation in the presence of frequently experienced stimulation.

(Penney & McCann, 1964, p. 323)

An adult scale under the joint authorship of Penney and Reinehr (The Stimulus-Variation Seeking Scale; Penney & Reinehr, 1966) was reported to be a measure of "exteroceptive stimulus-variation seeking" and defined the exteroceptive stimulation seeker as:

- (1) one who approaches and explores relatively new stimulus situations, (2) one who approaches and explores incongruous and complex stimuli, and (3) one who responds so as to vary stimulation in the presence of frequently experienced stimulation.

(Penney & Reinehr, 1966, p. 631)

The behavioural referents for these differently labelled constructs are identical in all but the age status of the test respondents.

There are many attempts in the literature to order and to classify the range of behaviours generally understood to indicate curiosity. Examination of these systems points to the existence of a significant commonality as to what constitutes curiosity. This is true despite important differences in terminology and argument as to the appropriate defining criteria.

Maw and Maw

One very widely used and influential definition is that set out

by Maw and Maw (1961, 1964; Maw, 1967). They present a definition stated in terms of a set of behavioural categories appropriate for identification of curiosity in elementary school children. Their definition was constructed by putting together statements about the nature of curiosity gleaned from a wide variety of sources - informal and formal interviews, a review of its use in the literature, and examination of both old and contemporary dictionary definitions. From analysis of all these statements they arrived at the following defining criteria:

An elementary school child was said to exhibit curiosity to the extent that he:

1. reacts positively to new, strange, incongruous, or mysterious elements in his environment by moving toward them, by exploring them or by manipulating them
2. exhibits a need or a desire to know more about himself and/or his environment,
3. scans his surroundings seeking new experiences,
4. persists in examining and exploring stimuli in order to know more about them.

(Maw & Maw, 1961, p. 299)

The construct of curiosity described through this definition incorporates most, if not all, of the aspects of exploratory and novelty seeking behaviour which have been isolated in research studies. It includes exploration of the novel, close investigation of a stimulus, and seeking for novel stimuli.

Livson

Also basing his analysis on a review of the literature, particularly the published research on curiosity, Livson (1967) has argued that:

Curiosity is a tendency, or motive, to acquire or transform information under circumstances that offer

no immediate adaptive value for such activity.
(Livson, 1967, p. 76)

This characterization emphasizes the motive status of curiosity. It is amplified through a behavioural classification scheme which Livson developed to complement his proposal that the study of curiosity requires an open naturalistic setting. He suggested that the situation must be one "in which the subject is free to wander about and to select what he will from the available patterns and to do as he chooses with them." (p. 79) The classification he outlined has four main categories.

Seeking curiosity: the individual bestirs himself and alters his environment in such a way that informational input is modified.

Noticing curiosity: new patterns attract attention.

Examining curiosity: the holding power of a given situation.

Productive curiosity: the production of uncertainty.
(Livson, 1967, pp. 80-82)

The behavioural referents indicate that this construct of curiosity includes the motivation of exploratory and investigatory activity as well as novelty seeking.

Other writers have defined curiosity through elaboration of an explanatory system for intrinsic motivation. By virtue of an appeal to the nature of the basic units of the system, constructs such as curiosity and novelty seeking are either grouped together or sharply distinguished. Two of these systems are outlined here: McReynolds (1971a, 1971b, 1972), who groups curiosity and novelty seeking as members of the class of innovative behaviour, and Beswick (1971, 1974), who sets them apart.

McReynolds

Reviewing the literature on the nature and assessment of intrinsic motivation, McReynolds (1972) distinguished two types of intrinsic motivation:¹ innovative behaviour and commitment behaviour. Innovative behaviour refers to:

those activities of a person, both overt and covert, that can plausibly be conceived to lead to relatively immediate alteration in the person's internal representation of his overall stimulus environment... a class name to include the behaviors sometimes referred to in the technical literature as "novelty seeking", "variation seeking", "stimulus seeking", and "sensation-seeking" as well as the areas of curiosity and exploratory behaviour.

(McReynolds, 1972, p. 161)

Commitment behaviour is that which appears to be intrinsically motivated but is distinguished by the "degree of personal involvement and dedication that the individual invests in the activity." (p. 163)

A significant feature of McReynolds' formulation is the group of constructs which comprises the class of innovative behaviour: novelty seeking, variation seeking, stimulus seeking, curiosity and exploratory behaviour. McReynolds (1971a) argues that there are two forms of motivation, sensory and cognitive. Sensory motivations are concerned with all basic bodily processes and serve to maintain the functioning of those processes. Cognitive motivations are involved in

¹ McReynolds expressed a preference for the term autonomous behaviour to provide a contrast with the behaviour which is extrinsically motivated or instrumental.

the functioning of the cognitive system, or, the totality of the information processing apparatus. In terms of intrinsic motivation or innovative behaviour, cognitive innovation is the process of restructuring and elaboration within the cognitive system.

McReynolds (1971a) refers to two "optimization rules" or basic principles of operation within the cognitive system. First, the quantity of unassimilated data tends to be kept at a minimum, and secondly, the process of cognitive innovation tends to occur at a certain optimal rate. There is:

a fairly constant input of novel perceptual data, which by definition is not immediately assimilable, in order to maintain the optimal innovation rate: at the same time there is a strong tendency to minimize the sum of unassimilated past input. The result is an ongoing process in which input data are, as it were, "digested" by the cognitive system. Further, this process involves not merely the digestion of data which "happen" into the cognitive system, but also implies an active seeking for new data to be digested.
(McReynolds, 1971a, p. 40)

Activities as diverse as hiking, playing chess, solving mathematical problems, have a certain innovative potential: a capacity for eliciting cognitive innovation. An individual will be most highly motivated to participate in those activities which match his optimal innovation rate.

This formulation preserves a distinction between terms such as curiosity and novelty seeking but links them together as different manifestations of the same behavioural principle: they are all behaviours which bring about some immediate change in the person's internal representation of his stimulus environment.

Beswick

Beswick (1964, 1971, 1974) has formulated a cognitive process theory of curiosity which like McReynolds' presents curiosity as a cognitive strategy or style. Cognitive functioning is described in terms of a category system or cognitive map which operates and changes through the complementary processes of assimilation and accommodation.

We assume a category system or cognitive map, which is a simplified grouping of experiences, to which incoming information is referred and within which it is coded for meaning. Input may be an external stimulus or a covert event... Individual differences in curiosity are seen to be a function of both category system characteristics and differences in the coding operation. The relevant differences in the coding operation are those which arise when there is some difficulty of coding. Whenever any degree of difficulty of coding is present, the coding operation will involve a corresponding degree of one or both of two processes of modification: assimilation and accommodation.

(Beswick, 1971, p. 157)

Beswick's theory focuses on the characteristic forms of behaviour which distinguish the curious person rather than defining a need or motivational state. The critical element in that characteristic behaviour is a responsiveness to conceptual conflict. He suggests that:

A cognitive strategy characterized by curiosity includes a tendency to create conceptual conflicts which arise from a careful regard for the uniqueness or novelty of a signal, together with care taken not to disrupt an ordered representation of the world. If curiosity behaviour is to ensue, this conflict must be suffered at least for a sufficient time for investigatory acts to take place, in order for new information to be put into the system and a new ordering to take place. A curious person must be open but also discriminating. The highly curious person appears to want to order experience as well as to experience disorder.

Curiosity may be understood as a predisposition to create, maintain and resolve conceptual conflicts.
(Beswick, 1974, p. 16)

This description of curiosity with its balance of openness and order is very specific in its referents and excludes the sensation seeking and novelty seeking forms which others have included. The latter Beswick (1971) argues are "mere gobbling up of stimuli" (p. 159). They lack the essential element of being a response to conceptual conflict.

The metaphors used by these two writers are illuminating. McReynolds (1971a) describes the cognitive innovation process through a digestion analogy, and applies it to a wide range of terms: curiosity, sensation seeking and novelty seeking. Beswick (1971) limits the term curiosity to behaviour which is a characteristic style of response to conceptual conflict and excludes the novelty seeking forms as a "gobbling up" of stimuli with the connotation of an undigested intake. Undigested apparently because the novel experience does not generate the same forms of processing as does the novelty which produces conceptual conflict: challenging existing codes, bringing about their modification and being incorporated into them.

Breadth and Depth Factors in Curiosity

Langevin (1971, 1972) intercorrelated the test scores from a set

of curiosity and intelligence measures administered to 269 sixth grade pupils. The mean age of the group was 11 years and eight months (SD = 6 months), and the group included approximately equal numbers of boys and girls. The seven curiosity measures used were selected to represent the types of curiosity test then in use and included both self-report and performance measures. Four factors were isolated from the test scores; two were labelled as intelligence factors and two as curiosity factors. The curiosity factors were designated "breadth of interest curiosity" and "depth of interest curiosity".

A similar finding has been reported by Henderson and Moore (1979). In the latter case a battery of four tasks measuring curiosity and exploratory behaviour was administered to a group of younger children (3-8 year-olds). The factor structure found in the test scores suggested four main factors. Henderson and Moore (1979) grouped these as mode of exploration (verbal, tactile) and style of exploration (breadth, depth) factors, findings congruent with and extending those of Langevin (1971, 1972).

The central proposition argued in this thesis is that the two factors isolated by Langevin (1971, 1972) and also found by Henderson and Moore (1979), represent two types or styles of curiosity, and provide a coherent framework for the analysis of human curiosity. It suggests that drawing a distinction between these two styles, while at the same time seeing them as subsets of the general class curiosity, will generate a productive synthesis of a broad and at times fragmented area of theory and research.

A number of interrelated issues concerning the nature of these

two factors and hence the nature of curiosity raised in Langevin's papers warrant consideration. They are:

1. breadth of interest curiosity and depth of interest curiosity as personality traits and/or motivational states, and,

2. the relationship between breadth of interest curiosity and depth of interest curiosity and the distinction between specific and diversive exploration.

A Personality Trait and/ or a Motivation State

After reviewing both the popular and the research literature on curiosity, Robinson (1974) concluded that there are three principal ways in which the word curiosity has been used.

It may refer to:

1. a motivational state mediating between stimuli and consequent behaviour... Thus, particular types of stimulation may be said to be more likely than others to provoke or arouse curiosity.
2. a class of behaviour directed towards acquiring information or knowledge about the environment, for example, exploring or asking questions.
3. a personality trait: an individual may be described as more or less "curious" in terms of the extent to which he is disposed to exhibit such behaviour.
(Robinson, 1974, p. 28)

Much of the research stimulated by Berlyne in the 1950s and 1960s was consistent with the first grouping. It was concerned with isolating those stimulus characteristics which initiated exploratory

behaviour. This can be clearly seen from an inspection of the titles of some of the papers published by Berlyne at that time.

Novelty and curiosity as determinants of exploratory behaviour

(Berlyne, 1950)

Conflict and information-theory variables as determinants of human perceptual curiosity

(Berlyne, 1957)

The influence of complexity and novelty in visual figures on orienting responses

(Berlyne, 1958a)

Uncertainty and epistemic curiosity

(Berlyne, 1962)

Complexity and incongruity variables as determinants of exploratory choice and evaluative ratings

(Berlyne, 1963)

Curiosity was seen as a motivational state aroused by certain classes of stimuli (novel, ambiguous, complex, incongruous), initiating exploratory behaviour.

In the late sixties and early seventies considerable attention was directed toward viewing curiosity as a personality trait. The case for curiosity as a personality trait was argued by Day (1966, 1969) on the basis of two findings. In his experiments using complex figural material as stimuli, Day found that preference for particular levels of visual complexity was relatively stable over time and that there were significant individual differences among respondents on various preference for complexity measures.

These two findings lent credence to the belief of the existence of a fairly stable personality characteristic of curiosity and launched the search for a measure of this trait.

(Day, 1969, p. 5)

In developing a measure of trait curiosity Day moved away from using complex visual shapes as the basic test form toward self-report inventories. His Ontario Test of Intrinsic Motivation (OTIM) (Day, 1969, 1971) consists of a large set of items each describing a particular situation and the respondent is required to circle TRUE or FALSE according to whether the statement represents their attitude.

e.g., If I worked in a factory, I would like to find out everything that is going on.

To me, the outdoors is the wild, little known country to investigate.

Day (1971) argued that:

A person can be said to have a trait characteristic of curiosity if he has the propensity for either becoming curious under more conditions (specificity), more readily becoming curious (reactivity), and/or possibly remaining in a state of curiosity for longer periods of time (chronicity).

(Day, 1971, p. 102)

In constructing a measure of the trait he attempted to formulate questions whose answers would represent the respondent's usual state (chronicity) or his usual manner of reacting (reactivity).

The same move towards considering curiosity and novelty seeking to be personality traits can be seen in the array of measures constructed at that time. Only a selection of the names is mentioned here as many of them receive detailed consideration in Chapter Five.

Change Seeker Index
(Garlington & Shimota, 1964)

T.A.T. of the Need for Variety
(Maddi, Propst & Feilding, 1965)

Stimulus-Variation Seeking Scale
(Penney & Reinehr, 1966)

Novelty Experiencing Scale
(Pearson, 1970)

Sensation Seeking Scale
(Zuckerman, Kolin, Price, & Zoob, 1964)

Test of Academic Curiosity
(Vidler & Rawan, 1974, 1975)

Test of Intrinsic Motivation
(Beswick, 1974)

All measures assume that there are relatively stable individual differences in curiosity or novelty seeking and that they can be measured through the responses sampled by their scales.

In his review of the then available measures of intrinsic motivation, McReynolds (1972) pointed out that all the tests had been concerned with the assessment of characteristic or trait levels of innovative behaviour. He suggested that an important gap in the literature was the absence of attempts to measure current or state levels of the same behaviour. Since then state scales have been published. The motivational state and personality trait approaches have been brought together into state/trait formulations and contingent scales.

Leherissey (1971), using Berlyne's distinction between specific and diversive exploration, perceptual and epistemic curiosity, suggested that it was possible to conceptualize both a state and trait for each of the four classes of curiosity behaviour. Looking at the measures available she suggested that the Sensation Seeking Scale (Zuckerman et al., 1964) provided a measure of trait diversive curiosity and the OTIM (Day, 1969) provided a measure of trait specific curiosity. However, neither distinguished between perceptual

and epistemic dimensions in their construction. At the time of her report (Leherissey, 1971) no other measures were available and she presented details of the construction and development of what she calls a "State Epistemic Curiosity Scale".

A different solution to the conceptualization of curiosity as both state and trait is found in the Melbourne Curiosity Inventory (Naylor, 1981), the first forms of which were being developed and tested in the early 1970s. The inventory consists of one trait and one state measure of curiosity.

It is proposed that C-Trait refers to individual differences in the capacity to experience curiosity. It is presumed that persons possessing more C-Trait experience a wider range of situations as curiosity arousing than do persons possessing less. It is also presumed that those possessing more C-Trait experience greater intensities of C-State... C-State refers to individual differences in response to a particular curiosity arousing situation. It is an index of the arousal of curiosity.

(Naylor, 1981, p. 173)

Both Leherissey (1971) and Naylor (1981) suggest that higher trait curiosity scores indicate that the person is more likely to respond with state curiosity to a wider number of situations, and more likely to have higher levels of intensity of state curiosity than will a person scoring lower on trait curiosity. They differ in the degree to which the scales are tied to Berlyne's classifications and explanatory system; Leherissey's scale being linked very closely to Berlyne's theoretical propositions.

Given that there is such a close link between the study of curiosity as a personality trait and a motivational state, it should be possible to conceptualize both trait and state aspects of the

breadth and depth of interest curiosity dimensions.

Langevin's (1971) presentation suggested that it was important to consider how the factors of breadth and depth of interest might relate to the different perspectives of personality and motivation. However, his analysis did not lead to any firm conclusions.

Of the two weak curiosity factors derived, breadth curiosity may reflect a personality dimension since two curiosity personality scales loaded on the Breadth Curiosity Factor, while the Depth Curiosity may reflect the intensity of a motivational state.

(Langevin, 1971, p. 369)

In his unpublished paper (Langevin, 1972) he also entertains the opposite possibility.

While breadth curiosity may reflect a personality characteristic and depth curiosity may reflect a motivational state, the opposite possibility should be entertained. Breadth curiosity may be a motivational state in which one flits from one stimulus or interest to another. On the other hand, depth curiosity might be an enduring response to novel stimuli encountered by the individual.

(Langevin, 1972, p. 92)

It is suggested here that the breadth of interest trait measures consist of those concerned with measuring individual differences in the tendency to seek varied and changing experiences. Depth of interest trait measures are concerned with detecting individual differences in the tendency to want to question, investigate and explore particular novel stimuli. State measures are concerned with detecting individual differences in the arousal of curiosity in settings relevant to the specific dimension being considered.

Breadth and Depth: Specific and Diverive

The second issue arises from the relationship between Langevin's two factors and Berlyne's distinction between specific and diverive exploration; a distinction which other writers (Day, 1968b; Leherissey, 1971) have elaborated into specific and diverive curiosity.

The Breadth and Depth Curiosity factors also suggest a dichotomy of diverive and specific curiosity. The former represents a tendency to seek stimulation from a variety of sources while the latter represent detailed exploration of a few or a single stimulus.
(Langevin, 1971, p. 370)

Berlyne's (1960) distinction between specific and diverive exploration was made in terms of features of the stimulus situation: behaviour directed towards a particular stimulus as opposed to behaviour without such direction, behaviour which is satisfied by the achievement of a particular end as opposed to behaviour which can be satisfied with stimuli from any of a wide range of sources. Most of Berlyne's writings have been concerned with identifying stimulus characteristics associated with the arousal of specific curiosity. Individual differences have been of secondary concern. However, his general propositions have been cited extensively by writers concerned with individual differences in responsiveness to curiosity-arousing stimuli, and the distinction specific/diverive has been assumed to be an appropriate classification framework.

One of the main writers using this distinction is Day and some consideration will be given to his work as it highlights important features of the distinction and the relationship with breadth of

interest and depth of interest curiosity factors.

Day (1969) proposed the following profile of the two personality traits specific and diversive curiosity.

The definition of the specifically curious individual which has guided this research, is as follows:

1. is interested in novel, incongruous or complex objects and events in his environment,
2. reacts positively to new, strange, incongruous or mysterious elements in his environment by moving towards them, by exploring, thinking or manipulating them, or by asking questions about them,
3. persists in thinking and exploring such stimuli in order to know more about them.

The diversively curious person, on the other hand, tends to be restless, easily bored, continually seeking change, but possibly fails to concentrate on these situations until full understanding is reached.
(Day, 1969, p. 4)

A close look at the definition of the specifically curious person cited above, suggests that points 1 and 2 are substantially the same. Point 2 appears to be a more explicit behavioural definition of what is meant by "interest in". Later definitions (Day, 1971, 1972) have corrected this by deleting point 1. Point 3, now point 2, has also been altered to read:

tends to persist in such positive reaction, gaining information in the process.
(Day, 1971, p. 102, 1972, p.3)

As described in these papers (Day, 1969, 1971, 1972) the trait of specific curiosity is very similar to the depth of interest curiosity factor. Differences between individuals are differences in the extent to which they explore, think, manipulate and ask questions about a particular novel situation confronting them.

The trait of diversive curiosity has been described by Day (1969) as a pattern of restless seeking out of novelty and change. This is similar to Berlyne's picture of diversive exploration but makes explicit, although a little tentatively, a difference from specific exploration in terms of the style of investigation. It is not directed toward a close understanding in the same way as is specific exploration. Diversive exploration (curiosity) and breadth of interest curiosity are directed toward experiencing novelty and change. Variety of experience is the focus.

The terminology "breadth of interest" and "depth of interest" curiosity emphasizes the critical difference between the two styles of exploratory behaviour. The close investigation of a novel stimulus characteristic of depth of interest curiosity is distinctively different from the seeking and experiencing novelty for its own sake characteristic of breadth of interest curiosity. Although emphasizing a difference similar to that involved in Berlyne's distinction between specific and diversive exploration, the terms "breadth" and "depth" do not imply any commitment to a particular explanatory system as do Berlyne's. (The issue of explanation will be taken up in Chapters Three and Four.)

Summary

Over the last two decades a substantial body of research has focussed on behaviour variously referred to as "curiosity", "novelty seeking" and "exploratory behaviour". A variety of definitions and

systems has been developed together with a range of new terms. "Sensation seeking", "stimulus variation seeking", "curiosity" and "exploratory behaviour" have at times been used as interchangeable, at others as indicators of quite separate constructs.

Breadth of interest and depth of interest curiosity dimensions were first reported by Langevin (1971, 1972), and more recently have been discussed by Henderson and Moore (1979). The proposition is that a two factor construct of curiosity, one which distinguishes between breadth of interest and depth of interest curiosity styles, can provide a coherent framework for the integration of theory and research into human curiosity.

Berlyne's early work on curiosity focussed on curiosity as a motivational state. Following on from this there was a strong move to look at curiosity from a personality perspective and this prompted the development of a wide range of curiosity measurement scales. Both of these approaches have more recently been brought together in several formulations which have produced state/trait curiosity inventories.

A construct of curiosity subsuming two different styles, breadth of interest and depth of interest, is compatible with both the motivational state and personality trait approaches.

The distinction between breadth and depth of interest curiosity emphasizes differences between the styles of approach to novelty. The types of situations prompting approach are different, and the quality of engagement with those situations is different. Breadth of interest curiosity can be characterized as an orientation towards seeking

varied and changing experiences: the quality of involvement is one of seeking change to experience what it is like. Depth of interest curiosity represents an orientation towards exploring and investigating new objects, events and ideas: the quality of involvement is one of experiencing the new to achieve an understanding of it. Construed in this way, the two concepts extend the specific/diversive distinction which appears in Berlyne's writings, but they are not tied to a particular explanatory system.

It is proposed that a two factor construct of curiosity distinguishing between breadth of interest and depth of interest styles of approach to novelty provides a coherent framework which effectively describes the range of behaviour which has traditionally been classed as "curiosity". However, to provide a productive synthesis this formulation must both be consistent with what is known about the processes which operate when curiosity is aroused and contribute to an extension of that knowledge. To this end, it is proposed to examine the nature and status of current theories of curiosity, and then against that background, to explore the usefulness of the two factor construct.

CHAPTER 3

CRITICAL THEORIES I :

OPTIMAL AROUSAL AND COGNITIVE THEORIES

Overview. In this chapter two of the most influential theories of curiosity, "optimal arousal" and "cognitive" theories, are outlined and the critical differences between them examined.

Both the "optimal arousal" and "cognitive" theories of curiosity are attempting to delineate those processes operating in situations where curiosity is aroused. Between these two viewpoints there is a strong measure of agreement over the important stimulus properties which provoke curiosity behaviour. Both characterize the stimulus situation in terms of a level of mismatch between its properties and the individual's expectancies or anticipations. It is argued that the basic difference between the two theories involves the role accorded to "arousal" in determining the direction of behaviour. For the optimal arousal theorist it is the crucial mediating variable; for the cognitive theorist, an organic concomitant of information processing.

In order to assess the relative merits of these viewpoints as explanations of human curiosity, the experimental evidence purporting to demonstrate the role of arousal as the crucial mediating variable is examined. Three sets of experimental evidence are considered in detail. The first set consists of studies in which certain stimulus properties are tested for their effects on exploratory behaviour. The second set involves studies attempting to relate those same stimulus properties to changes in arousal; and the third concerns tests of the effects of manipulation of arousal level on exploratory behaviour. The findings of this review prompt the conclusion that the available evidence does not generally substantiate the interpretations drawn from it by the optimal arousal theorists.

As explanations for approach to novelty the difference between the two theories becomes a difference between the motivating effects of "uncertainty" and "incongruity".

In Chapter Two it was argued that a construct of curiosity which distinguishes two separate curiosity styles, breadth of interest curiosity and depth of interest curiosity, is able to provide a productive synthesis of the current state of knowledge about human curiosity. It was also suggested that such a formulation is compatible with both the motivational state and personality trait approaches to the study of human curiosity.

Recently Maw and Maw (1978) reviewed the literature on curiosity and examined three main theoretical orientations: the optimal arousal theory, cognitive theory and social learning theory. Concluding their brief review Maw and Maw (1978) stated:

Reviewing the major theories of curiosity, one is impressed by their many areas of agreement. Perhaps one of the problems of measuring and assessing curiosity is that all of the theories make significant contributions to our understanding of the problem, but none can be clearly distinguished from the others.
(Maw & Maw, 1978, p. 532.)

The social learning theory, concerned as it is with an analysis of those features of the individual's past and present experience which influence the occurrence of curiosity behaviour, is not examined in detail here. In this chapter attention is focussed on the optimal arousal and cognitive theories. Both of these theories of curiosity present a system which attempts to describe those processes which operate when a stimulus attracts attention and is explored. They have been largely concerned with a motivational state approach to the understanding of human curiosity. They are addressing the issues of which stimuli or classes of stimuli are more likely to initiate curiosity, and what processes underlie such behaviour. Special

attention is directed in this chapter to highlighting the nature of the points of difference between these two types of theory.

Optimal Arousal Theories

Optimal arousal theories developed out of the early attempts to restate the primary drive concept in terms of the organism's arousal or activation level, thereby expanding it to encompass curiosity along with other forms of learned behaviour. Such a restatement was an important development in that the strength of drive came to be viewed as a function of the relation between the level of stimulation and that which was typical for the organism rather than a simple function of stimulus intensity. The basic units of analysis employed by the various arousal theorists are different but the general form of the explanation is similar. In order to demonstrate this the basic theoretical propositions of Leuba (1955), Berlyne (1960) and Fiske and Maddi (1961) are examined.

Leuba

One of the earliest statements of this general view was that of Leuba (1955). His outline of a theory of optimal stimulation arose out of his consideration of the inability of tension reduction based learning theories to account for situations where learning is the outcome of active stimulus seeking. He argued that:

Tension reduction would not seem to be a general or the only principle of learning. It may be only one aspect of a more general principle, a principle which might be called one of optimal stimulation: the organism tends to learn those reactions which will produce an optimal level of total stimulation.
(Leuba, 1955, p. 28)

This theory suggests that any organism's behaviour, and hence learning, is controlled by a tendency to maintain a characteristic optimal level of stimulation. If the level of stimulation is lower the organism will seek stimulation. If the level is higher it will seek to reduce the level of stimulation.

The organism tends to acquire those reactions which, when overall stimulation is low, are accompanied by increasing stimulation; and when overall stimulation is high, those which are accompanied by decreasing stimulation.

(Leuba, 1955, p. 29)

The optimal stimulation notion refers to all (both internal and external) sources of stimulation. It represents a relative rather than absolute level of stimulation allowing for both inter- and intra-individual variations. Intra-individual variations are related to various temporary conditions of the nervous system and Leuba (1955) cites the influence of drugs and tiredness as examples of sources of such variation. Changes in the level of stimulation which restore the optimum are experienced as pleasant and satisfying (positive affect), while changes away from the optimum level are unpleasant (negative affect).

In presenting this theory Leuba (1955) was postulating a general principle to encompass all learning; that which was the outcome of primary drive reduction and also that resulting from "reactions which

bring the environment to bear upon the sense organs and increase the stimulating capacities of the environment" (pp. 28-29).

Berlyne

Berlyne (1960) proposed the same general principle but expressed it in terms of the organism's state of "arousal". Arousal, he suggested:

Is a measure of how wide awake the organism is, of how ready it is to react. The lower pole of the continuum is represented by sleep or coma, while the upper pole would be reached in states of frantic excitement.
(Berlyne, 1960, p.48)

The analogy of muscle functioning was introduced to explain the arousal mechanism and Berlyne borrows from it the notion of a "tonus".

A degree of muscle tonus is maintained by a normal waking human being, even when he is resting. A state of generalized muscular relaxation would imperil prompt action. A state of high muscular tension would not only be exhausting but would reduce the plasticity of the response mechanism. So moderate tension is maintained as the most advantageous compromise. The actual level of tonus varies. When the need for rest becomes pressing or when the chances of a call to action are unusually low, more or less, complete relaxation may be appropriate. But in circumstances where stress is unusually plentiful and long lasting, motor units may be tuned to a tautness that would threaten physical or psychological health if continued indefinitely but can be sustained with impunity for short periods.
This principle of chronic tonus, which is so familiar in so far as it affects muscular tension, seems likely to apply to other aspects of the organism's functioning, including arousal, and for the same reasons.

(Berlyne, 1960, pp. 183-184)

Those aspects of stimulation which can affect arousal: intensive

variables (e.g., intensity, size, pitch, colour), affective variables (e.g., fear, excitement), and collative variables (e.g., novelty, incongruity, ambiguity), are referred to as "arousal potential", and it is the particular relation pertaining between the level of arousal potential and the organism's current arousal tonus which controls behaviour.

A later article co-authored by Day and Berlyne (1971) puts this general position into a set of theoretical propositions.

1. Each individual seeks to maintain a tonus level of arousal.
 2. The tonus level varies among individuals, within each individual over time, and with extended exposure to a particular environment.
 3. Change in arousal level may be induced both externally and internally.
 4. Moderate increases in strength of stimulation are perceived as pleasant, but large changes are abhorred and induce behavior aimed at reducing arousing qualities in the stimulus.
 5. There are individual differences in tolerance and preference for arousal potential.
- (Day & Berlyne, 1971, pp. 302-304)

In short, the model proposes that the crucial variable for understanding and predicting behaviour is the person's arousal level.

Fiske and Maddi

Another version of the same basic principle has been developed by Fiske and Maddi (1961) and in this case the basic unit is one of "activation" rather than "arousal". They defined "activation" in the following way.

Activation is a basic dimension referring to the common core in such variables as alertness,

attentiveness, tension, and subjective excitement. It is a postulated central nervous system phenomenon which affects other parts of the organism. We use the

term arousal to refer to the somatic correlates of activation.

(Fiske & Maddi, 1961, p. 14)

Fiske and Maddi (1961) set out a formal conceptual framework which consists of eight propositions the contents of which are substantially the same as those quoted from Day and Berlyne (1971).

1. The impact of a stimulus is its momentary contribution to the activation level of an organism.
2. An organism's level of activation varies directly over time with the total impact of current stimulation.
3. The impact of a stimulus is derived not only from the intensity and meaningfulness of the stimulus but also from the extent to which it provides variation from prior stimulation.
4. For any task, there is a level of activation which is necessary for maximally effective performance.
5. The behavior of an organism tends to modify its activation level toward the optimal zone for the task at hand.
6. For each stage in an organism's sleep-wakefulness cycle, there is a characteristic or normal level of activation.
7. In the absence of specific tasks, the behavior of an organism is directed toward the maintenance of activation at the characteristic or normal level.
8. Negative affect is ordinarily experienced when activation level differs markedly from normal level; positive affect is associated with shifts in activation toward normal level.

(Fiske & Maddi, 1961, pp. 18-46)

Although the unit of analysis in each of the above statements of theory is different, the form of the theory is similar: an optimal level of stimulation/arousal/activation, contributed to by all internal and external stimuli operating at any one time, individual variations in the optimal level, and positive affect with changes toward the optimal level.

Arousal and Drive

It was suggested above that this general line of theory developed out of attempts to salvage the primary drive model as a general theory of motivation by introducing some mechanism which would explain stimulus seeking or curiosity behaviour. A comprehensive account of the relationship between arousal and drive is presented in Berlyne's (1967) contribution to the Nebraska Symposium on Motivation, and re-iterated in the posthumously published chapters of a book which he was in the process of writing when he died (Berlyne, 1978).

Berlyne (1967) drew an analogy between the construct of arousal and the factorial model of intelligence. In such a model arousal would be the counterpart of Spearman's 'g' factor, the variance held in common by many response measures in a wide variety of situations. Drives and emotions would be the equivalent of second and later order group factors, while the more numerous specific factors would be represented by variables at the level of specific indices of arousal.

Berlyne (1967) distinguished three different forms of drive concept and considered each of them in relation to the concept of arousal he proposed.

The first notion of drive was:

Something whose rise to a higher level means an increase in the overall activity level of the organism and an indiscriminate strengthening of any responses that happen to be evoked or instigated.
(Berlyne, 1967, p.17)

This concept of drive has very close points of correspondence with the arousal dimension.

The second notion of drive was:

A collection of specific drives, each of which brings to the fore a specific class of behaviour, whether innately or through learned associations with the corresponding drive stimuli.

(Berlyne, 1967, p. 17)

Berlyne suggested that this concept of drive is related to the arousal concept by virtue of the fact that responses associated with specific drives seem to be controlled through the hypothalamus and limbic system.

Finally, there is the notion of drive as a variable intimately connected with reinforcement and reward.

(Berlyne, 1967, p. 17)

Berlyne examined the evidence concerning the relationship between arousal and this third form of drive in considerable detail and concluded that reinforcement depends upon changes in arousal level. He argued that stimulus properties of the psychophysical, ecological and collative categories affect reinforcement in the same way and that they are interchangeable, less of one can be compensated for by more of another. The basis of their similarity was suggested to be the common intermediary of their effect on arousal level and from this Berlyne argued that reinforcement depends on changes in arousal.

Optimal arousal theory posits arousal as the key unit in a general theory of motivation. It subsumes and extends the notion of drive in that it also offers an explanation for exploratory and

stimulus seeking behaviour which earlier drive concepts were unable to handle adequately.

Curiosity and Optimal Arousal Theory

From the perspective of optimal arousal theory, and using Berlyne's terminology, curiosity is a drive state. The onset of this drive state is triggered by stimuli having appropriate levels of arousal potential: exposure to collative variables such as incongruity, novelty or ambiguity produces a state of subjective uncertainty or conflict and thereby alters arousal level.

We appropriately speak of "curiosity" whenever a person or animal undergoes subjective uncertainty and is, in consequence, impelled to engage in specific exploratory responses. The origin of subjective uncertainty in human beings is frequently (and, in animals, virtually always) incomplete perception of some object or event and, in particular, inadequate opportunity to extract enough information from the source of stimulation to indicate either what action is appropriate or that no action is required.
(Berlyne, 1978, pp. 160-161)

Arousal is the variable mediating between stimulus impact and the consequent exploratory behaviour.

Cognitive Theories

A significantly different account of curiosity and stimulus seeking behaviour is presented by those writers who can be classed

together as cognitive theorists. Dember (1974) pointed to a "cognitive revolution in motivation" when he claimed:

Human beings and lower animals are attracted by, and their behavior is reinforced by, the informational properties (e.g., novelty, complexity) of stimuli, in much the same way that they are influenced by stimulus intensity or whatever it is that gives potency to the conventional "homeostatic" incentives and rewards....

An alternative approach to one that employs arousal as the mediating variable is to stick with events as perceived or otherwise processed ("understood", "categorized", "associated to", "imaged" or what have you) and to search for the properties of these events that relate to the behavioral choices that people and animals make.

(Dember, 1974, pp.163-164)

One writer whose work highlights the critical difference between theories of curiosity proposed by cognitive theorists and that of arousal theorists is J. McVicker Hunt (1960, 1963, 1971). Hunt uses the phrase "motivation inherent in information-processing and action" to refer to what other writers have called curiosity or intrinsic motivation.

Hunt

According to Hunt (1960, 1963, 1971) exposure to a given stimulus event activates certain memory codes or residues of past experience. When there is a discrepancy or incongruity between the information properties perceived and the codes activated, information processing behaviour occurs. In the case of a novel stimulus being presented incongruity between the perceived features of the stimulus and existing memory codes would result in some form of exploratory or information seeking behaviour. It could be that the novel stimulus on

further inspection is recognized as an unfamiliar instance of an existing category or it could become the basis for the development of a new category.

When expounding this theory of the motivation inherent in information-processing, Hunt (1963, 1971) pointed to two significant changes in the form of functioning attributed to the central nervous system from that assumed by the arousal theorist. He argued firstly, that the basic functional unit of the reflex arc had been replaced by that of the feedback loop, and secondly, that overall brain functioning, once seen as a static switchboard is now more appropriately viewed as "an anatomical setting for active information processes" (Hunt, 1963, p.44). It is the nature of the relation between incoming signals and the system's expectations or anticipations which instigates and directs behaviour. A moderate discrepancy between input and expectation will instigate further information-processing directed towards supplanting incongruity with congruity.

The important unit in this analysis is incongruity or dissonance. Hunt (1960) suggested:

This incongruity-dissonance principle makes both motivation and reinforcement intrinsic, if you will, to the organism's information-processing. It is as if the organism operated like an error actuated feedback system where the error is derived from discrepancy between receptor-inputs of the present and the residues of past experience which serve as the basis for anticipating the future. The dominant view of the past half century has seen both motivation and reinforcement as extrinsic to the information-processing.

(Hunt, 1960 p.500)

Incongruity and Arousal

There is then an important difference between the cognitive and arousal viewpoints in terms of the relationship assumed between the motivational variable and the behaviour which is being motivated. Arousal theories, following the general form of the primary drive model propose a motivational variable, arousal, which is conceptually independent of the behaviour it instigates. Arousal levels can, according to these theorists, be identified by physiological indices which are independent of both the stimulus conditions and the behaviour which follows. Cognitive theories of motivation, on the other hand, are suggesting that the motivational unit (for Hunt incongruity) is intrinsic to the information-processing behaviour and cannot be specified apart from it. Incongruity is defined by Hunt in terms of the degree of mismatch between the information input and the memory codes or expectancies activated by that input. Arousal is then viewed as an organic concomitant of information-processing but is not the crucial variable motivating exploratory and investigative behaviour.

The Conflict

As has been indicated, the essential difference between these two viewpoints hinges upon the role accorded the arousal variable: the crucial mediating variable as it is for arousal theorists, or an

organic concomitant of information-processing as it is for the cognitive theorists. This important difference between the theories can be illustrated by considering what is happening in the following hypothetical situation. A pair of stimuli is presented to an individual. Stimulus X consists of a novel arrangement of lines, stimulus Y a very familiar arrangement. The individual presented with the stimulus pair inspects stimulus X for a longer time than he does stimulus Y.

From an optimal arousal viewpoint (e.g., Berlyne), the stimuli within the pair can be characterized as having different levels of collative variability. The individual explores stimulus X because the level of collative variability and its associated arousal potential induce uncertainty thereby raising the individual's arousal level. The arousal potential of stimulus Y is lower than that of stimulus X. There are two critical elements here: the relative levels of collative variability (with consequent differences in arousal potential) among competing stimuli, and the person's level of general arousal. That stimulus whose associated arousal potential moves the organism's arousal level closer to the optimum will be selected over others. Emphasis is on the relationship between the arousal potential of the stimulus and the person's level of general arousal.

From the cognitive viewpoint adopted by Hunt it would be argued that the stimuli vary in their level of incongruity. The novel stimulus has a higher level of incongruity than has the familiar stimulus. The novel stimulus does not match clearly any stored representation or information coding structure, whereas the familiar one fits easily into the existing processing structures. Tension or

arousal which accompanies the incongruity energizes the exploratory behaviour. Selectivity is towards an optimal level of incongruity. The critical element is the relation between incoming signals and the individual's expectations or anticipations. Changes in arousal and the other features of exploratory behaviour are contingent upon this.

Berlyne's "subjective uncertainty" and Hunt's "incongruity" both refer to elements of a mismatch between input and expectancy. The difference between the two theoretical orientations lies in the role accorded to arousal in directing behaviour.

To appreciate the basis of this difference in viewpoint and assess the validity of the claims which accord a crucial mediating role for arousal, the evidence cited by Berlyne and his co-workers will be examined. There are three main sets of data upon which Berlyne rests his case:

- (i) Studies which link increased exploratory behaviour with exposure to stimuli high in collative variability,
- (ii) studies which link increases in arousal with exposure to stimuli high in collative variability, and
- (iii) studies which link changes in arousal with changes in exploratory behaviour.

Collative Variability and Exploratory Behaviour

Some of the earliest work reported by Berlyne (1958a) examined the influence of certain stimulus properties upon exploratory behaviour. Novel stimuli were shown to be more likely to attract

visual orienting movements than stimuli which had been encountered previously in the experiment. Participants in the experiment were required to look for 10 seconds at pairs of pictures projected side by side on a screen. Over a block of 10 trials each trial had the same animal picture projected on one side of the screen while the paired picture was changed. The results indicated longer fixation times for the novel pictures.

The same paper (Berlyne, 1958a) reported experiments using stimulus materials designed to vary specific complexity elements; irregularity of arrangement, irregularity of shape, and, other materials designed to vary incongruity levels. Again it was found that for all the different sets of stimuli the more complex or more incongruous stimulus was fixated for a significantly higher proportion of the total exposure time than was the other member of the pair.

A supplementary report (Berlyne, 1958b) indicated that when exposure times were increased to two minutes the same effect was evident: more time was spent looking at the more complex or more incongruous member of the pairs of figures.

In another experiment (Berlyne, 1957) the performance measure was a button pressing task whereby the person could choose to repeat the stimulus presentations for as long as he liked. When he had seen enough of one figure he signalled "Yes" and the experimenter replaced it with a new figure. The stimulus attributes involved were: incongruity, complexity (relative uncertainty), surprisingness, and complexity (absolute uncertainty). In each case the stimulus with higher collative variability attracted more investigatory responses.

These and many other studies attest to a strong link between those stimulus properties collectively designated collative variability (e.g., novelty, incongruity, ambiguity) and levels of exploratory behaviour. This same body of evidence, however, is also consistent with the cognitive viewpoint represented by Hunt. The stimulus materials designed by Berlyne to represent different levels of collative variability with their corresponding levels of exploratory behaviour, would equally for Hunt represent situations of varying incongruity. The same pattern of exploratory behaviour would be predicted.

Collative Variability and Arousal

The studies in this group consist of experiments using collative variability as the treatment and measuring the consequent variation in arousal levels. Berlyne (1967) argued that the link between these two conditions has been demonstrated quite clearly.

Among collative properties that have been shown to influence arousal are novelty (Berlyne, 1960; Berlyne et al., 1963), surprisingness (Berlyne, 1961), and several variables that are covered in everyday parlance by words such as complexity and incongruity.
(Berlyne, 1967, p. 20)

However, close examination of the details of these experiments suggests that the relationship is not as clear as Berlyne claimed. Some of these studies will be considered in detail. Most studies have used GSR (galvanic skin response) measures as the index of arousal.

A series of experiments using paired lights set up in a diamond arrangement was designed to test the effects of conflict and surprise on arousal. In one of these studies (Berlyne, 1961) the task involved pressing a key to indicate the direction of the lights on the panel. For a low conflict treatment the two lights appeared in the same corner of the diamond while for a high conflict treatment two lights appeared in opposite corners. High conflict trials were reported to have larger stimulus-onset GSRs than low conflict trials. The same paper reported a word association task for which high uncertainty stimulus words had larger GSRs than low uncertainty stimulus words.

In another experiment reported in the same paper (Berlyne, 1961) the light panel was used to vary surprise without its effect being confounded by the variable novelty. This was achieved by giving instructions to the effect that lights would appear at one of the two corners, designated A and B, in alternation. The following series was given:

AB AB AB AB AB AB AB AB AA AB AB

The surprise trials (AA) were associated with greater GSRs than the non-surprise trials (AB).

An important factor complicating the interpretation of such studies is the use of physiological measures such as the GSR as an index of arousal. Such measures have been shown (Lykken, Rose, Luther, & Maley, 1966) to display marked individual differences in their maximum and often their minimum levels. Lykken et al. (1966) point out that this variation in range of measured response is often unrelated to the variable which the physiological measure is being used to

index. The design of experiments using physiological indices such as the GSR must build in some means of correcting for this extraneous individual variability.

Some studies, e.g., Berlyne, Craw, Salapatek and Lewis (1963) have allowed for this factor of individual variability in the range of response through the form of measurement employed. Rather than using a measure based on the amount of change in skin resistance levels, the measure used was one of the relative incidence of change. Berlyne et al. (1963) reported a series of experiments examining the relationship between arousal and various collative properties of stimuli. They argued that the GSR is one of the most sensitive components of the orientation reaction and hence is indicative of a rise in arousal. GSR measures were recorded and used in the following way:

The mean number of GSRs was treated as the principal dependent variable. A GSR was counted if (a) a downward deflection in the resistance tracing appeared after the onset of an exposure and no later than 4 sec. after its termination, and (b) a downward deflection was followed within 10 sec. by a trough and subsequent return upwards:

(Berlyne et al., 1963, p. 563)

In their experiment pairs of visual patterns were presented. One of each pair was classified "less irregular" (LI) and the other as "more irregular" (MI). The patterns used were from the standard sets used in earlier studies by Berlyne (e.g., Berlyne, 1957, 1958a, 1963). GSR measures were recorded and the mean number of GSRs was used as the dependent variable.

In their conclusions they reported:

There is thus some indication of a greater incidence of GSRs with more complex or incongruous visual patterns, but this effect is only in evidence when Ss

are highly attentive.¹ And the effects of complexity variables on the GSR are certainly not comparable with the pronounced effects that these same variables have on exploratory behavior.

It may, however, be concluded with reasonable confidence that GSR incidence increases with novelty (as shown by the decline over successive patterns and the decline over successive presentations of the one pattern), that GSR incidence increases with extrinsically motivating instructions, and that GSR amplitude increases with incongruity.

(Berlyne et al., 1963, p. 567)

The main conclusion with respect to collative variability and arousal was that arousal increased with novelty and with incongruity. Within the set of stimulus materials there were eight categories of pattern each distinguished by a particular collative property: irregularity of arrangement, amount of material, heterogeneity of elements, irregularity of shape, incongruity, number of independent units, asymmetry, and random distribution. The first four categories were grouped as "low complexity" and the second four as "high complexity". The results for "complexity" involved comparisons between these two groupings and so drew on data from all eight categories of pattern. A greater incidence of GSRs with more complex patterns only occurred in the extrinsically motivated group. The results for the "incongruity" effect refer only to one pattern, i.e., one LI/MI pair of stimuli. When presenting the results the authors commented:

The data are not numerous and sensitive enough to permit a meaningful comparison of mean numbers of GSRs for MI and LI patterns within categories. However, an amplitude score was worked out for every GSR, using the log-conductance-change measure....

The mean amplitude scores for the first presentation

¹One group were informed that they would later be required to recognize the patterns. GSR measures were significantly higher in this group than in the group who had no "extrinsic motivation" instruction.

of the MI and LI figures of each category were taken, omitting those Ss in whom neither figure in that category produced a GSR. None of these within-category differences was significant with the exception of those in Category E (incongruity).
(Berlyne et al., 1963, pp. 565-566)

These results although providing some support for the theory that incongruity influences arousal could not be considered a conclusive demonstration of the proposed effect of collative variability on arousal level.

Another paper co-authored by Berlyne (Berlyne & Lawrence, 1964) reported the outcome of two experiments in which visual figures were exposed for 0.2 seconds and GSRs recorded. The visual figures varied along the dimensions of complexity and incongruity. Two different forms of GSR measure were used in the two experiments: a skin potential and a skin resistance measure.

Neither the first experiment, measuring skin potential, nor the second experiment, measuring skin resistance, showed any of these variables to have a significant effect on the magnitude of the GSR.... Later phases of the same experiments in which Ss could look at the figures for as long as they wished, showed exploration of more irregular (i.e., more "complex" or "incongruous") figures to be significantly longer for all five variables studied with low-complexity material and with one of three variables studied with high-complexity material. This confirmed an effect that previous experiments, using different techniques, had demonstrated with the low-complexity material, but that had not previously been tested with the high-complexity material.

(Berlyne & Lawrence, 1964, p. 43)

Again a clear demonstration of the influence of collative properties of stimuli on arousal is more elusive than that of the influence of collative properties on exploratory behaviour.

A different index of arousal was used in an experiment reported by Berlyne and McDonnell (1965). Their study examined the influence of the standard materials on the EEG component of the orientation reaction. The results confirmed their hypothesis. The mean duration of desynchronization in the EEG pattern was greater for the more complex patterns over all categories and in every category except one (irregularity of shape). They concluded:

On the basis of this and previous experiments, we can put forward with fair confidence the view that the collative stimulus properties influence arousal processes. In this experiment, the effect occurred even when there was no extrinsic motivation and subjects were given no special reason to attend to, or be aroused by, the stimulus patterns.
(Berlyne & McDonnell, 1965, p. 159)

While there have been some findings which support a link between collative variability and changes in physiological indices of arousal, the case upon examination, does not appear to be as conclusive as Berlyne (1971) has claimed.

Arousal and Exploratory Behaviour

Reviewing the experiments which have attempted to look at the influence of arousal on exploratory behaviour through manipulation of arousal, Day (1967) pointed out that the results are generally inconclusive. Some have reported a decrease in exploration under arousing conditions, others have found no change, and one study (Day & Thomas, 1967) found an increase in attention for high complexity stimuli in a group given an arousing agent d-amphetamine.

The basic design for such studies involves manipulating arousal by some agent (instructions, drugs, etc.) other than the stimuli presented for exploration.

One such experiment reported by Berlyne and Lewis (1963) manipulated arousal levels through different sets of instructions (2 groups), and for a third group white noise was taped to the person's ears throughout the experiment. One of the experimental tasks involved the pressing of a button when enough had been seen of a figure projected onto a screen. When the button was pressed a new stimulus was presented. A second task involved choosing from two stimuli one to be viewed again. There were three arousal raising treatments. One group was told that there would be a retention test for a list of common nouns read to them during the early stages of the experiment. A second group was told that the final part of the experiment involved receiving some electric shocks "somewhat painful but not too terrible and not at all harmful" (Berlyne & Lewis, 1963, p. 402). The third treatment was the white noise.

Each of the three arousal raising treatments (retention test, shock, white noise) was effective as shown by steeper falls in measured skin resistance for the experimental groups than for the control group.

The stimulus materials were the same as those used by Berlyne and Lawrence (1964) and detailed earlier. For the button pressing task it was found that over all groups there was a significantly higher mean duration of exploration for "medium irregularity" (MI) patterns than for "low irregularity" (LI) patterns. Again the influence of collative

properties on exploratory behaviour was demonstrated clearly.

Differences between control and experimental groups, i.e., the effect of different arousal levels, was not as clearly established. The exploration time measure indicated that the mean duration for inspection of the MI patterns in the control group was slightly lower than that for the three experimental groups but this was not found to be a significant difference. The data from each of the 20 patterns were examined and in all cases the mean exploration time for the control group was lower than that for the experimental groups. Using a sign test this was a significant effect.

For the choice task the arousal treatments operated in the opposite direction, but again the differences between control and experimental groups were not sufficiently strong to achieve statistical significance in terms of the planned form of data analysis. The mean number of MI choices was slightly higher in the control than in the experimental groups.

An analysis of variance with the within-group between-individuals estimate as the error term produced no significant F values...

Nonparametric tests over categories of patterns were then carried out. The mean number of MI choices was greater in the C group than in the three experimental groups for seven categories out of eight with a tie for the remaining category. Wilcoxon's T test shows that $p < .02$ for this result.

(Berlyne & Lewis, 1963, p. 406)

When discussing these results Berlyne and Lewis suggest that for the choice task the lower level of exploratory behaviour with heightened arousal occurred because it was a situation where the arousal potential of the stimuli would be close to optimum for the control

group, and so disturbing to the already aroused experimental groups. In the button pressing task on the other hand, there was an opportunity to explore the uncertain stimulus and

If, for some extraneous reason, his arousal is already high, it apparently takes longer for perceptual curiosity to reach its threshold level, so that the duration of exploration is increased.
(Berlyne & Lewis, 1963, p. 408)

Apart from the fact that the results are not as convincing as the authors may have wished, they are open to different interpretation. The same pattern of results could be interpreted as being consistent with a cognitive viewpoint where incongruity or information characteristics are the critical variables influencing exploratory behaviour. Introducing an extraneous source of arousal increases the incongruity level of the situation. The arousal raising instructions are an element of the total complex of information in the experimental situation. In the button pressing task those undergoing the experiment had to manage the irrelevant information of the anticipated memory test, the impending electric shocks, or the everpresent white noise, as well as attend to the stimulus. They might therefore be expected to take longer to view to their satisfaction each of the MI stimuli, than would those in the control group. The same interpretation would hold for the choice task, only in that case it could be argued that the extra information load for the experimental groups might predispose them to choose the simpler of the two stimuli.

Hence the results of this experiment if accepted as having demonstrated different levels of exploratory behaviour to be associated with different levels of arousal cannot be proffered as critical evidence in deciding between the arousal and cognitive

viewpoints.

Day (1967) outlined an experiment which manipulated arousal through a white noise treatment. Measures were taken of the amount of time spent fixating visual patterns. A curiosity score was derived as the proportion of total time spent fixating the high complexity alternative. Those participating in the experiment were drawn from a larger group and consisted of those who had scored in the extreme 20th percentiles on a manifest anxiety scale. High and low anxious participants were then randomly allocated to treatment groups. The result which Day singled out for greatest attention was that of a significant within subjects anxiety and noise interaction effect. The low anxious groups showed an increased attention to the more complex material in the white noise condition, while the high anxious groups had greatly decreased attention for the more complex material in the white noise condition.

Day (1967) interpreted these data as evidence that the directionality of the response is determined by the level of arousal and took this as further evidence supporting an earlier argument that:

Curiosity is a state of arousal intermediate in level to that of anxiety but on the same continuum and distinguishable from it in the direction of the response.

(Day, 1967, p. 190)

This interpretation of the results is not the only possibility. Arousal level was manipulated through a white noise treatment. Day argued that:

Since it is reasonable to believe that these Ss had not been exposed to extremely high levels of white

noise before and did not find it therefore aversive, it can be assumed that WN affects only "neutral arousal".

(Day, 1967, p. 189)

Arguing from a cognitive viewpoint it could be suggested that for the participants in the experiment the presence of the white noise makes it part of the total information in the situation and therefore could not be considered to be "neutral arousal".

Hunt (1963) has argued that a critical experiment to distinguish between the validity of the cognitive and arousal viewpoints would be one:

based on giving subjects tests in which they have a choice of novel, and presumably exciting stimuli, or familiar, and presumably unexciting, stimuli, both before and after injections of either epinephrine or Ringer's solution. One might assume that subjects free to operate about as they choose would come into such an experiment with the level of either arousal or incongruity near the optimum.. the increase in arousal produced by the injections of epinephrine should tend to reduce the proportion of novel stimuli chosen in the post-injection test as compared with the pre-injection test, and this reduction would be greater for those subjects injected with epinephrine than for those injected with Ringer's solution. If, on the other hand, it is incongruity rather than arousal which determines the hedonic value of stimuli and the direction of behavior, the injections of epinephrine might be expected to alter choices no more than injections of Ringer's solution.

(Hunt, 1963, p. 81)

Haywood and Hunt (1963) performed just this experiment but found a rather unexpected twist in the results.

It is clear from these results that injections of epinephrine have no more effect upon novelty preference than do injections of Ringer's solution. This is what would be expected if it is an optimum of incongruity rather than an optimum of arousal which determines the direction of behavior toward a source of novel or incongruous information.

(Haywood & Hunt, 1963, p. 211)

The meaning of this finding was not very clear as a critical test of the theories because the influence of the drug on indices of arousal was not in the expected form. Two different-sized doses of epinephrine were used in the experiment (.8 mgm and .4 mgm). Both doses resulted in heart rate and pulse pressure increases but the palmar sweating index remained constant. There was a tendency towards a decrease in the palmar sweating index after the injection followed by a rise after the post-injection tests of novelty preference, but these trends were not statistically significant. For Haywood and Hunt (1963) the palmar sweating index results were the most important in that palmar sweating had previously been found by Haywood to be associated with incongruity.

Another experiment following the same form but using a different drug (d-amphetamine) has been reported by Day and Thomas (1967). They found a marked increase in the attention being directed towards the more complex of the two stimuli under the influence of d-amphetamine. Day and Thomas had predicted a decrease in the proportion of time spent attending to the more complex alternative under the drug treatment. In the drug treatment group arousal would have been above the optimum. They argued that the different pattern of findings was related to the type of experimental task in that it was one of "forced" rather than "free" exploration.

It appears therefore, that an increase in arousal does, in fact, affect the exploratory response. However, the change in level of arousal may result in more vigorous specific exploration when the organism has no escape but in the avoidance of variability and high levels of stimulation whenever possible.

(Day & Thomas, 1967, p. 1124)

It could be argued that this form of experiment by its very nature could not provide the critical data required to decide between the two theoretical orientations. Hunt (1963) has suggested that if the incongruity interpretation is correct there should be no difference in exploratory behaviour for the drug and control treatments. This ignores an important element in the situation. Although drug and placebo treatments are the same in that both groups receive an unnamed injection and hence have the same information with which to construct the situation, the drugs do have noticeable effects on bodily sensations. Day and Thomas (1967) when presenting their reasons for choosing d-amphetamine over epinephrine describe its effects in the following way:

Unlike epinephrine, d-amphetamine has only mild peripheral sympathetic effects but crosses the blood-brain barrier and has marked central effects. While there is some evidence that... even a small amount of epinephrine may result in conditions of anxiety in humans, d-amphetamine appears to have positive cognitive effects.

(Day & Thomas, 1967, p. 1120)

Some of the positive cognitive effects detailed are feelings of euphoria, optimism, friendliness and energy, and an increased willingness to take risks. Hence, extra information in the form of knowledge of current bodily sensations and feelings contributes to the person's construction of the situation.

Given such complex effects of these drugs they could not be considered to be affecting what the arousal theorists refer to as neutral arousal. From the cognitive viewpoint it could quite reasonably be argued that arousal is one of a set of information

elements which together constitute the incongruity to which the person responds.

The Construct of Arousal: An Evaluation

The basic difference between optimal arousal and cognitive theories of curiosity is centred upon the role accorded to the arousal variable. Optimal arousal theories have presented arousal as a global variable: the overall level of psychophysiological activity. Recently developments in the study of brain activity suggest that this characterization is an oversimplification. In a recently published paper, Vanderwolf and Robinson (1981) have argued that the traditionally held view that cerebral activation is correlated with arousal and deactivation with relaxation, sleep or coma, has only limited validity. They suggest that the number of exceptions to this generalization undermine any utility it may have had, and that it should be replaced with a more complex model of the relationship between behaviour and brain activity. In place of the general arousal theory Vanderwolf and Robinson (1981) propose a model distinguishing two separate kinds of input from the reticular activating system to the hippocampus and neocortex.

The details of their system do not emerge unscathed from the critical pens of the discussants invited to comment on their paper. However, there does appear to be general agreement among the discussants that the global notion of arousal needs to be replaced by a more complex model of the different psychophysiological states which

are associated with different behaviours.

A similar view is presented by Zuckerman (1979) when he suggests that the optimal arousal model originally proposed as the theoretical base for his studies of the trait of sensation seeking needs serious revision. He therefore argues in favour of a model which distinguishes two separate arousal systems. One arousal system involves the reticular activating system, the other the reward system of the limbic area which has its own separate pathways to the cortex. Zuckerman (1979) acknowledges that his earlier writings had emphasized the first arousal system (reticular-cortical) as the basis for the sensation seeking trait, but more current evidence, he suggests, points strongly in the direction of the second arousal system (limbic system) being the critical base.

These recent writings suggest that there is a strong move towards re-evaluation of the notion of a general arousal variable which is the key motivational mechanism.

Summary

In this chapter the optimal arousal and cognitive theories of curiosity have been outlined. It has been suggested that the basic difference between these viewpoints involves the role accorded to the arousal variable. Optimal arousal theories propose that selectivity in human behaviour is towards that stimulus which moves the individual's level of general arousal towards the optimum. There are two critical

elements involved in stimulus selection in this formulation: the relative levels of arousal potential among competing stimuli, and the person's existing level of general arousal.

On the other hand, cognitive theorists suggest that selectivity is determined by the information properties of the competing stimuli. The critical element is the relation between incoming signals and the individual's expectations and anticipations. Selection is towards an optimal level of incongruity. Changes in arousal and other features of exploratory behaviour are contingent upon this.

The characterization of the important stimulus elements is similar. Berlyne's "collative variability" which induces uncertainty, and Hunt's "incongruity", both refer to elements of mismatch between inputs and expectancy. The role accorded to arousal is the critical difference between the two viewpoints.

A large body of experimental findings has accumulated dealing with the relationships between stimulus properties, arousal, and exploratory behaviour. These findings were examined in some detail to determine whether they substantiated the arousal theorists claims about the critical role of arousal.

Three groups of studies were discussed. The first group, using collative variability as an independent variable and exploratory behaviour as the dependent variable, has consistently shown a strong link between collative variability and levels of exploratory behaviour. However, such research findings are also compatible with the cognitive viewpoint.

The second group of studies, which had collative variability as an independent variable and arousal as the dependent variable, has been less conclusive. Some studies have shown an influence of collative variability on arousal, others of similar design have not.

The same pattern of inconsistent findings is found in that set of studies which have manipulated arousal and observed the consequent effects on exploratory behaviour. Where differences in exploratory behaviour have followed the arousal-raising treatments, and this has not always been the case, it has not been possible to interpret the results unequivocally.

Examination of the experimental evidence which purports to demonstrate the role of arousal as a crucial mediator of the effect of collative variability on exploratory behaviour has shown this evidence to be generally inconclusive. In the absence of such demonstration the difference between optimal arousal and cognitive theories in their explanations of approach to novelty becomes a difference between the motivating effects of "uncertainty" and "incongruity".

Both of these theories present a system which attempts to describe those processes which operate when a stimulus attracts attention and is explored. They have been largely concerned with a motivational state approach to the understanding of human curiosity, addressing the issues of which stimuli or classes of stimuli are more likely to initiate curiosity, and what processes underlie such behaviour.

In Chapter Four differential emotions theory which combines both motivational state and personality trait perspectives, will be explored to determine whether it is able to shed any further light on those processes operating in situations where curiosity is aroused.

CHAPTER 4

CRITICAL THEORIES II: DIFFERENTIAL EMOTIONS THEORY

Overview. A different approach to explaining the bases of curiosity behaviour is contained within the "differential emotions" theory of Izard (1977). The critical element in this theory is the treatment of emotion as a general motivational variable. Variables such as curiosity are viewed as "affective-cognitive structures" elaborated out of the person's innate emotion processes. The important explanatory constructs in differential emotions theory are described to indicate the degree to which the affective-cognitive structures construct can be used to account for complex motivational and personality dimensions such as curiosity.

Differential emotions theory as a theory of curiosity is then compared with the optimal arousal and cognitive viewpoints. It is suggested that many of the differences between these three theories are differences of emphasis, especially in terms of which variable, or set of variables, is critical in directing approach to novelty. The conclusion is drawn that differential emotions theory with its emphasis on the role of emotions in the elaboration of complex motivational patterns, presents the most comprehensive framework within which the nature of different curiosity styles, and in particular breadth of interest and depth of interest curiosity, can be explored.

The basic proposition which distinguishes differential emotions theory from other theories of motivation, and hence curiosity, is its emphasis on the role of emotion as a general motivational variable. In his writings Izard (1971, 1972a, 1972b, 1977) charts the course taken by successive theories of emotion giving particular attention to recent cognitive theories. The latter, he argues, are still inadequate to account for:

The highly important and ever-present phenomena of selectivity and purposiveness or directionality in

perceptual-cognitive functioning... the person's pattern of emotions subserves selective perception and cognition, with the emotion of interest-excitement normally playing a critical role.

(Izard, 1972b, p. 103)

Differential emotions theory distinguishes three major types of stable motivational variables: drives, emotions, and affective-cognitive structures or orientations. The term drive refers to any motivational state brought about by tissue change or tissue deficit. The emotions are complex motivational phenomena which have distinct patterns of neurophysiological, motor-expressive and experiential components. Affective-cognitive structures or orientations arise when there is some form of bond or association of one of the affects with images, words, thoughts or ideas. Affects is a general term inclusive of all the fundamental emotions, patterns of emotions, drives and their interactions. From this basis Izard suggests that:

What other theories explain in terms of some variant of the concept of intrinsic motivation, differential emotions theory explains in terms of the motivational properties of the two positive emotions and their interactions with other affects and cognitions. It maintains that much of the behavior explained in terms of intrinsic motivation is a function of the emotion of interest-excitement and its interactions with perceptual and cognitive processes. The emotion of enjoyment-joy also helps account for some intrinsically motivated behavior, as does of course, interest-joy interactions.

(Izard, 1977, p. 191)

Before considering the contribution of this theory against that of those discussed earlier (arousal and cognitive theories) some attention will be given to the detail of Izard's theory.

Differential Emotions Theory

Differential emotions theory proposes that there are 10 discrete fundamental emotions which occur in human behaviour: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, disgust-revulsion, contempt-scorn, fear-terror, shame-humiliation, guilt-remorse.

Each fundamental emotion has unique motivational and phenomenological properties which lead to different behavioural consequences. These 10 fundamental emotions interact with and influence homeostatic, drive, perceptual, cognitive and motor processes.

The Emotion Process

Emotion is defined in differential emotions theory as a process with three interrelated components: electrochemical activity in the nervous system, a characteristic facial expression or neuromuscular-expressive pattern, and specific subjective or phenomenological qualities. Under certain unusual conditions one of these components may be dissociated from the others but they are characteristically interactive and interdependent. Socialization processes may operate to diminish the duration and/or intensity of the expressive pattern, masking its part in the emotion process.

The scope of the role proposed for the emotion process in the

instigation of behaviour can be appreciated through a consideration of the variety of ways Izard sees it combining with other motivational variables and with perceptual and cognitive processes. Alongside the operation of each of the 10 fundamental emotions there is the possibility of emotion-emotion interactions, emotion-drive interactions, the development of affective-cognitive structures, and then further interaction of these with the fundamental emotions. The system thereby allows for an extensive variety of motivational phenomena and so offers a useful framework for understanding complex human behaviour:

An individual expands his flexibility and adaptability as a living organism as he generates more and more cognitions or cognitive mechanisms for influencing emotion and emotion-related behaviors.
(Izard, 1972b, p. 67)

The specific characteristics ascribed to the emotion process by Izard are critical for distinguishing his theory from other cognitive theories of emotion and also for addressing the general problem of selectivity in perceptual-cognitive functioning.

The emotion process has specificity. The neurochemical impulses activated when stimuli impinge upon the receptors initiate a particular emotion, joy, fear, excitement, not just an undifferentiated emotion state. The neurophysiological, motor-expressive, and phenomenological components of joy are different in important ways from those activated in fear.

Izard suggests that this specificity is due to the operation of a number of factors:

Any of these principles - selective sensitivity of innate neural programs, changes in density of neural firing, idiosyncratic experience, and socialization - may activate or influence the activation of an emotion and play some role in the emotion process and in emotion-related person-environment interactions.
(Izard, 1972b, p. 62)

Each of the factors referred to here will be considered in turn with particular reference to the emotion "interest-excitement".

Selective sensitivity. Izard proposes the existence of innate pathways or neural programs which are selectively sensitive to certain inputs or environmental conditions. Certain species-specific stimuli initiate distinct patterns of excitation. In support of this proposition he cites the findings of investigators such as Fantz (1973), who have demonstrated selective responsiveness to stimuli in very young infants. Certain visual patterns can be shown to be preferred over others. A review of some of the experiments reported by Fantz (1973) illustrate this finding.

Infants being tested were placed in a hammock-type crib inside a stimulus chamber and the stimulus targets exposed on the ceiling. The experimenter observed the infant's direction of gaze through a peephole in the ceiling. With infants up to six months as experimental subjects there was evidence of a consistent preference for a bull's eye target over stripes and for a check target over a plain square. Within the bull's eye/stripes pair the experimenters found a striking developmental shift in preferred target.

The striped pattern was significantly preferred by infants under two months of age, while the bull's eye

pattern was strongly preferred after this age. This change was not due to repeated testing since it was also evident from the first tests of infants of varying ages.

(Fantz, 1973, p. 624)

Fantz (1973) also reported a variety of experiments which used stimuli with different degrees of likeness to a human face, and concluded that there was an unlearned attraction to the intrinsic stimulus characteristics of a human face.

His finding of a significant decrease in responsiveness to familiar targets after the age of two months is consistent with the notion of innate mechanisms guiding the selectivity of infant visual behaviour. Eleven complex magazine photographs were used as target stimuli. One of these was chosen to serve as a constant pattern for each infant and exposed in turn with each of the other 10 novel patterns. The position of the constant pattern was varied.

The trend is clear and significant in spite of wide fluctuations in response among the infants and among successive exposures. Infants under two months showed no change, whereas the three older groups showed a decrease in response to the repeatedly-exposed pattern. In terms of absolute fixation time, the novel patterns came to receive more attention as the constant pattern received less, so that the total fixation time remained high throughout the test... Thus, the change cannot be attributed to sensory adaptation, fatigue, decreased arousal, or any general response decrement. It indicates instead the perception, recognition, and satiation of visual interest in a specific complex stimulus. High response to novelty is seen in this context as the unlearned visual interest in a pattern which has not been satiated by repeated exposure.

(Fantz, 1973, p. 629)

The same emphasis on innate mechanisms guiding the selectivity of infant behaviour is found in the conclusions drawn by Emde, Gaensbauer and Harmon (1976) who conducted a longitudinal study of expressions of

emotion in infancy. Emde et al. (1976) concluded that there were three levels of development of affect expression during the first year of life. The first level is described as a crying level. Adults are able to distinguish between two main forms of infant affect expression: crying and contentment. The second level occurs at about two months with the development of the smiling response which is accompanied by a dramatic increase in behaviour described as active, curious and exploratory. At the third level (approximately nine months) stranger distress is observed adding fearfulness to the crying-contentment, and smiling patterns.

Despite individual differences in age of appearance of these emotional expression patterns the researchers concluded from their data that they emerge at a particular time primarily as a function of the maturation of underlying biological processes.

It seems useful to think of the first level of organization as characteristic of the neonatal period. After this, reorganizations of behavior occur, with new affect behaviors central to new communication systems. The new affect behaviors undoubtedly have an innate basis: they appear to be universal; they emerge at the same developmental points and with the same initial qualities in congenitally blind infants (Fraiberg, 1971), and twin studies show a more precise concordance of onset among monozygotic than among dizygotic twins (Freedman, 1965). Since these affect expressions reflect a maturational self-organizing tendency that has come about through evolution, we speculate that they have some survival value.

(Emde, Gaensbauer, & Hamon, 1976, p. 143)

Changes in density of neural firing. Following Tomkins (1962) Izard suggests that the density of neural firing is an important feature of the particular emotion process activated. Density is the product of the intensity by the number of neural firings per unit

time. Tomkins proposed that differences between affects can be traced back to differences in the underlying neural firing.

Surprise, fear, and interest, according to our theory are similar in each being innately activated by any increasing gradients of neural firing over time. Surprise we think requires the steepest gradient, fear less steep, and interest the least steep of the three gradients. In contrast, we assume that distress and anger are innately activated by levels of neural firing rather than gradients of neural firing... Enjoyment is innately triggered by any decreasing gradient of neural stimulation.

(Tomkins & McCarter, 1964, p. 137)

It follows from this position that stimuli which produce the particular effects described above will be observed to arouse the corresponding affects.

If a very steep gradient of neural stimulation will activate the startle or surprise response, then so too will many stimuli which produce such neural stimulation. Thus a pistol shot, with its approximately square wave physical properties, will frequently startle, via a steep gradient of central neural stimulation. Similarly, any sudden movement of any object in the environment may trigger fear if it is very sudden, or interest if it is less sudden.

(Tomkins & McCarter, 1964, p. 137)

The correlation between external stimulus characteristics and the quality of neural firing is not perfect and so neither is their correlation with affect. What produces a startle response on first encounter is unlikely to produce the same level of response a second time. The correlation is further reduced through the operation of memory and thought in the activation of affects.

Both Tomkins (1962) and Izard (1977) are careful to distinguish affect from what other theorists refer to as activation or arousal. Emotion processes involve specific patterns of neural excitation

rather than general undifferentiated arousal. The reticular formation is interpreted as exercising an amplification-attenuation function rather than being the central mechanism.

We now know that the reticular formation is capable of increasing the response of the cortex and decreasing the response of the cortex, of increasing the response of motor reflexes and decreasing the response of motor reflexes, of decreasing sensory neural responses and increasing the response of individual retinal units and of decreasing and increasing autonomic responsiveness. It seems inadvisable, therefore, either to stress exclusively the effect on the brain, since it appears to have widespread effects up, down and sideways, or to stress its arousal function, since it can either amplify or attenuate the numerous structures it influences. Further, this amplifier-attenuator system not only influences other structures but is itself capable of being amplified or attenuated by the cerebral cortex and by the autonomic systems, through humoral stimulation via the blood stream and by sensory bombardment.

Amplifiers, drives and affects are each governed by long-term as well as transient factors, and each system may superimpose its characteristics on the other with varying degrees of dominance for varying periods of time at different stages of the others long-run trends. Each system varies in part as a function of the two other systems and in part independently.

(Tomkins, 1962, pp. 105-106)

All fundamental emotions are receptive to nonspecific amplification by the brainstem reticular activating system. It is important to see the emotion as separate and distinct from its amplification, and thus distinct from what is usually termed activation or arousal.

(Izard, 1977, p. 213)

Idiosyncratic experience and socialization. Experience, both idiosyncratic and that common to a cultural group, elaborates the innate programs to develop a complex system whereby many different person-environment transactions can activate emotion processes. With respect to the emotion "interest-excitement" repeated exposure to the

same stimulus significantly diminishes the level of response. Izard (1977) suggests that the course of its socialization is no different. It is influenced by socioeconomic conditions: variables such as the amount and variety of stimulation available, and, the complexity of family activities. A critical factor in the development of a child's capacity for interest and excitement is suggested to be the encouragement parents and adults give to play and exploratory activities.

It is this emphasis on the nature of emotion as an intra-individual process with an hereditary base which allows Izard to claim that emotions are key motivational variables accounting for the selectivity characteristic of most human behaviour.

Affective-Cognitive Structures

Izard (1977) argues that personality consists of a complex organization of six subsystems: homeostatic, drive, emotion, perceptual, cognitive and motor. Each subsystem has a degree of autonomy but at the same time all are interrelated. The last four are considered to be the most important for personality, social interaction and higher-order human functioning. Differential emotions theory suggests that from these six subsystems four major types of motivation are generated: drives, emotions, affect-cognition interactions and affective-cognitive structures. The last two of these appear to be especially important in explaining features of behaviour

such as curiosity.

An affect-cognition interaction is a:

Motivational state resulting from the interaction between an affect or pattern of affects and cognitive processes. Such interactions are innumerable and they vary with the particular person-environment transaction.

(Izard, 1977, p. 45)

They are temporary phenomena but their occurrence provides the basis for the development of affective-cognitive structures.

Affective-cognitive structures are:

Psychological organizations of affect and cognition - traitlike phenomena that result from repeated interactions between a particular affect or pattern of affects and a particular set or configuration of cognitions. A complex affective-cognitive structure or an interrelated set of them may constitute an affective-cognitive orientation, a more global personality trait, trait complex, or disposition such as introversion.

(Izard, 1977, p. 45)

This theoretical framework allows a very comprehensive treatment of a construct such as curiosity. In the psychological literature curiosity has been considered both as a motivational variable and also as a personality trait. Izard's notion of an affective-cognitive structure brings together both strands: affective-cognitive structures are motivational variables which produce behaviour or action tendencies and at the same time their stability and pervasiveness allows them to be characterized as traits.

Curiosity behaviour is the outcome of the operation of particular affective-cognitive interactions and structures; affects linked to

particular sets of cognitions. A single act of curiosity behaviour such as the longer fixation of the more novel of a pair of stimuli used in Berlyne's experiments (e.g., Berlyne, 1958a) would be attributed to the interaction between an emotion or pattern of affects and the cognitive processes initiated by exposure to the stimulus pair: in its simplest form arousal of the emotion "interest".

A trait or disposition of curiosity whether it took the form of an interest in resolving problems or an interest in seeking variation and change is explained by the operation of affective-cognitive structures. The two traits breadth of interest and depth of interest curiosity would be expected to show both similarities and important differences in the content of the affective-cognitive structures of which they are comprised.

Three Theories of Curiosity

In the previous chapter optimal arousal and cognitive theories of curiosity were examined through a consideration of the particular explanatory systems developed by Berlyne (e.g., Berlyne, 1971) and Hunt (e.g., Hunt, 1971). Differential emotions theory offers a different emphasis for an analysis of curiosity.

The important differences between these three theories can be illustrated by considering further the hypothetical situation presented in Chapter Three.

A pair of stimuli is presented before an individual. Stimulus X consists of a novel arrangement of lines, stimulus Y a very familiar arrangement. The individual presented with the stimulus pair inspects stimulus X for a longer time than he does stimulus Y.

It was suggested in Chapter Three that the optimal arousal viewpoint as developed by Berlyne proposes that the individual explores stimulus X because the level of collative variability, and its associated arousal potential, induces uncertainty thereby raising the person's existing arousal level towards the optimum. The arousal potential of stimulus Y is lower than that of stimulus X. There are two critical elements: the relative levels of collative variability (with consequent differences in arousal potential) among competing stimuli, and the individual's existing level of general arousal. That stimulus whose associated arousal potential moves the person's arousal level closer to the optimum will be selected over others.

Emphasis is on the relationship between the arousal potential of the stimulus and the person's level of general arousal.

From the viewpoint adopted by Hunt it would be argued that the stimuli vary in their level of incongruity. The novel stimulus has a higher level of incongruity than has the familiar stimulus. The novel stimulus does not match clearly any stored representation or information coding structure whereas the familiar one fits easily into the existing processing structures. Tension or arousal which accompanies the incongruity energizes the exploratory behaviour. Selectivity is towards an optimal level of incongruity. The critical

element is the relation between incoming signals and the individual's expectations or anticipations. Changes in arousal and the other features of exploratory behaviour are contingent upon this.

Given the same situation Izard would argue that the stimuli differ in the degree to which they activate emotion processes. The pattern of excitation from the novel stimulus would have a form consistent with the emotion process of interest; with complex stimuli, an affective-cognitive structure elaborated from the fundamental emotion of interest. The neural excitation would lead to a particular pattern of neuromuscular responses together with the feeling of being interested in stimulus X. This would result in exploration of stimulus X.

The critical element is the patterning of neural excitation. The patterning determines its identity as part of one of the basic motivational variables: drives, emotions, and affective-cognitive orientations.

An Evaluation

The differences between these three viewpoints are differences in emphasis especially in terms of which element is the critical factor directing behaviour. The critical factor for one system is represented in the others but playing a different role. Affect which is critical for Izard is a by-product or secondary element in the cognitive and optimal arousal theories. Similarly the individual's level of general arousal, critical for Berlyne, has a secondary role in the other two

formulations. The information-processing emphasis of Hunt is present in the other theories but is not on its own the critical element. Information-processing structures have a role in the perceptual processing that registers the arousal potential of a stimulus. Berlyne's notion of collative variability implies that some processing of stimulus characteristics is part of the impact of the stimulus which makes up its arousal value. In the same way the operation of affective-cognitive structures depends upon some information-processing occurring in the initial stimulus impact.

As was argued at the end of the discussion of optimal arousal and cognitive theories, it has been difficult for proponents of optimal arousal theory to demonstrate convincingly that it is the relationship between the arousal potential of the stimulus and the individual's general level of arousal which is critical in determining the direction of behaviour. Information-processing and cognitive theories have emphasized the importance of the relationship between the information properties of the stimulus and the individual's expectations or anticipations in directing behaviour but this leaves the basis for the selectivity of the expectations or anticipations unresolved.

Differential emotions theory postulates that the selectivity of behaviour can be accounted for by emotion processes and their affective-cognitive derivatives. The information properties of the stimulus through their excitation of the emotion "interest-excitement" guide investigative or curiosity behaviour.

Two Affective-Cognitive Structures

Within differential emotions theory approach to novelty is seen as the outcome of an excitation of the emotion interest-excitement. It is through arousal of interest-excitement and its associated structures that the information properties of a stimulus situation initiate and direct that approach to novelty.

Breadth and depth of interest curiosity represent two different styles of approach to novelty. The types of situations prompting approach are different and the quality of engagement with those situations is different. Breadth of interest curiosity is an orientation towards seeking change and variation: a person takes off on a trip with no pre-planned or definite routes or timetables. The quality of the involvement is one of seeking change to experience what it is like. On the other hand, depth of interest curiosity is an orientation towards exploring and investigating new events, ideas, and phenomena: a person drops everything to study something interesting. Here the quality of involvement is one of experiencing the new to achieve an understanding of it.

When describing affective-cognitive structures Izard refers to two forms of curiosity. These forms closely parallel the breadth and depth of interest distinction. He speculates about the particular affective-cognitive structures which might be involved in what he refers to as sensation seeking and intellectual curiosity.

Regular or frequent occurrence of two or more fundamental emotions that interact with a particular set of cognitions may produce an affective-cognitive

structure or orientation with traitlike characteristics. The descriptive term affective-cognitive orientation seems a particularly useful way of conceptualizing certain personality traits. For example, the interest-fear combination may be frequently associated with cognitions about risking and escaping danger for fun and thrills and result in the affective-cognitive orientation (or trait) of sensation seeking. However, the interest-fear combination may be associated with the risk-taking involved in exploration for the sake of discovery, and in this case the affective-cognitive orientation could be intellectual curiosity.

(Izard, 1977, p. 50)

Breadth of interest curiosity is suggested to be based on an interest-fear pattern of emotions. This pattern of emotions has become linked with a certain group of cognitions. The relevant set of cognitions are those involving events, activities, and situations which for the individual concerned are perceived as promising change and variation.

Depth of interest curiosity is suggested by Izard to also involve an interest-fear pattern of emotions. In this case the relevant set of cognitions are situations, events, and ideas perceived as representing new problems, or puzzling phenomena. Although it may be possible to consider approach to this type of activity as representing some cognitive risk, this type of situation does not have the same element of danger or implied threat as is often associated with the situations representative of seeking variation and change. This being the case, the pattern of emotions which are involved in the affective-cognitive structure of depth of interest curiosity is less likely to consist of an interest-fear combination than is the breadth of interest pattern.

The particular pattern of emotions associated with interest-excitement in both breadth of interest and depth of interest

curiosity, then becomes an empirical question and will be taken up in the research report in Section Two, Chapter Nine. The important conclusion that can be drawn from this discussion is the obvious potential of the two construct classification of curiosity styles linked with differential emotions theory, to illuminate further the nature of those processes involved in approach to novelty, and from there to guide further research.

SECTION I:

SUMMARY

The three chapters in Section I have all been concerned with distilling from the research literature those features of our understanding of human curiosity behaviour which can contribute to a meaningful synthesis and thereby guide further research.

Chapter Two reviewed the wide range of definitions and classifications of curiosity which appear in the research literature. At the end of that chapter it was proposed that a two factor construct of curiosity distinguishing between breadth and depth of interest styles of approach to novelty provides a coherent framework which effectively accounts for the range of behaviour which has traditionally gone under the title of curiosity.

Chapters Three and Four outlined some of the theories which have sought to delineate what processes are operating in situations where curiosity is aroused. The optimal arousal, cognitive, and differential emotions theories were all described and examined in detail. It was argued that the differences between these three theories are basically differences in emphasis, especially with respect to which variable, or set of variables, is critical in directing approach to novelty.

The conclusion was drawn that differential emotions theory, and more particularly its affective-cognitive structures construct, presents the most comprehensive theoretical framework within which the

nature of different curiosity styles can be explored.

Section II addresses some of the research questions generated by the foregoing analysis. The first of these is the construction and validation of a measure of curiosity which distinguishes effectively between the breadth and depth of interest curiosity styles. The second involves an examination of the characteristic differences between the breadth and depth of interest curiosity styles at the level of their component affective-cognitive structures. It examines those patterns of emotions which are aroused in situations characteristic of each of the two curiosity styles.

SECTION II

BREADTH AND DEPTH OF INTEREST CURIOSITY STYLES:

Investigations of the validity of a two factor
construct of curiosity.

CHAPTER 5

THE MEASUREMENT OF CURIOSITY IN CHILDREN AND ADULTS

Overview. In this chapter the wide range of assessment forms which have been used for research on curiosity in both children and adults is reviewed. The structure and content of these measurement forms together with their commitment to any particular theoretical viewpoint is examined to determine the nature of the curiosity construct involved, and its relationship to the breadth of interest and depth of interest formulation. As part of this scrutiny of the measures the relationships between scores on the various assessment forms are presented.

Measurement of curiosity in children has employed three main assessment forms: performance measures, teacher ratings, and self-report scales. Construction of these measures has often been pragmatic rather than adhering closely to any particular theoretical system. The upshot of this, most notably in the area of performance measures, has been insufficient attention to qualitative differences between the activities from which the scores derive. Studies examining the relationship between measures of curiosity in children have generally found only very small overlap between those measures.

Measures of curiosity in adults have typically taken the form of self-report questionnaires, and are more likely to have been developed in an attempt to operationalize the central construct of a particular theoretical system. Most of the scale development research reports have included some indication of how that scale relates to other scales, and from these reports it is possible to draw some conclusions about the constructs underpinning the scales.

The findings from this body of literature on the measurement of curiosity in children and adults does not support the notion of a general factor of curiosity. Rather, a two factor construct distinguishing between breadth of interest and depth of interest components appears to be a more reasonable synthesis of the extensive array of measures and findings.

Measurement of Curiosity in Children

A large number of measures has been developed to assess curiosity in children. Some studies (e.g., Penny & McCann, 1964) have been concerned primarily with test development and have linked their test(s) to a particular body of theory concerning the nature of curiosity, most often that of Berlyne. Others (e.g., Medinnus & Love, 1965) have been concerned with examining the relationship between curiosity and another variable, and to do this have developed their own distinctive measures of curiosity. This second group has often taken as a subsidiary concern the question of the relationships between the various curiosity measures used in their research.

The following pages detail some representative examples of the main types of curiosity measure appearing in the research literature, findings concerning the relationships between the measures, and consider what light they shed on the distinction between breadth of interest and depth of interest factors.

Types of Measures

Performance Measures. An interesting variety of situations has been devised to provide performance measures of curiosity. Most have involved assembling together an array of objects to be presented to the children being assessed. Others have devised a novel situation and the child's reaction to the situation is systematically recorded and

used to arrive at a measure of curiosity. All provide a measure based on observation of the child's activity rather than depending upon reports of behaviour. However, analysis of these measures suggests that some important qualitative distinctions within this general class of behaviour have not been given sufficient attention.

McReynolds, Acker and Pietila (1961) constructed an object curiosity scale based on a conception of human motivation concerned with "the tendency of individuals to seek novelty in their perception." (p. 393) The task was designed for 6th grade pupils and involved systematic observation of the exploratory behaviour which occurred when the pupil was presented with a number of interesting objects. The objects included items such as an apple, a plastic clothes peg, a miniature flashlight, a ping pong ball, and toy rubber pliers. In the test a set of objects was presented to the respondent for identification by touch and manipulation. A second set of objects was presented for free play and the number of manipulations recorded. In both cases the child's exploratory behaviour was recorded according to a predetermined schedule of possible manipulations. The curiosity score was calculated as the total of all manipulations of the object.

Langevin (1971, 1972) devised an exploration time measure of curiosity which involved 6th grade pupils being presented with objects which had appeared as items on a previously administered self-report questionnaire. Each pupil was presented with five items which had previously been rated "most interested in experiencing" together with three randomly selected items. A second measure recorded was the number of questions asked about the five "chosen" items at the end of the exploration time. The items included such things as:

Five shells were displayed on a 18" x 30" blue bristleboard. There were two King Conch shells and three Speckled Snail shells.

(Item on questionnaire: "I want to feel a big conch shell from the ocean")

Ten black and white slides from various silent films were presented. The sequence of slides starts from the Keystone Cops and ends with the first "talking" movie.

(Item on questionnaire: "I want to see slides from a 1920 movie")

(Langevin, 1972, p. 121)

Considerable ingenuity has gone into the development of "situations" used to assess curiosity in children. As one of his curiosity situations Coie (1974) used a box apparatus of the following form:

The box-shaped apparatus was constructed so that a large brass crank on the front of the box turned a multicolored wheel mounted on the top of the box. Also, on the front of the box were three switches marked "on" and "off". When the first two of these switches were turned on (as they were when the subject found the box), turning the crank also caused two lights mounted on either side of the crank to flash. The third switch caused the box to emit a buzzing sound which went on and off as the crank was turned. Two small doors opened to permit a view of the inside of the box by means of mirrors mounted inside the box.
(Coie, 1974, p. 96)

The children in Coie's study encountered the box while waiting outside a trailer used by the experimenter. The time taken to approach to within 2-3 feet of the box was recorded as well as the number of activities performed on the box apparatus.

In a study investigating exploratory behaviour in preschool children, Rabinowitz, Moely, Finkel, and McClinton (1975) devised a

novel toy and compared the children's behaviour with that toy to their behaviour with toys familiar in the pre-school setting. The novel toy consisted of:

A brightly colored paperboard form 7 feet wide and 4 feet high placed upright near one wall (novel toy). The form contained the painted figure of a clown driving a train engine. Two buzzers were activated by pushing buttons that formed the clown's eyes; levers located on either side of the form rang a bell on the train or caused the clown's nose to light up.

(Rabinowitz et al., 1975, p. 28)

Comparisons between children playing alone and with same-sex peers for the novel and familiar toys were made through measures of the amount of time spent with the novel toy and the information gained - discovery of the hidden buzzer.

In each of these tasks a particular novel stimulus or set of stimuli, is presented and the child's response, whether it be number of manipulations, length of time, number of questions, or information gained, is used as the index of curiosity. More questions, longer time, more manipulations are assumed to represent a stronger interest in finding out about that stimulus and hence a higher level of curiosity.

However, such measures may overlook important qualitative differences between the activities from which the score was derived. Especially important are that set of differences which has been used to distinguish exploration and play, a distinction often claimed to parallel that of the difference between specific and diversive exploration.

The importance of this distinction for interpreting such performance scores has been illustrated by Hutt (1970). The test situation reported involved a comparison of the activities of 3-5 year old children with novel and familiar toys. The familiar toys were commercially available toys and the novel toy consisted of a box with a moveable lever, mounted on a table. On different occasions manipulation of the lever produced sounds and/or lights. Hutt demonstrates the different patterns of result obtained when a distinction is drawn between investigation and play.

Exploration showed an exponential decline with time under the simple incentive conditions; when auditory feedback was available, exploration manifested a non-monotonic increase with time. In the first two of these conditions, playful activities hardly occurred at all. When the two behavior categories were considered separately, the pattern changed markedly. While investigation or specific exploration showed a non-monotonic linear decrease with time, playful responses were essentially a quadratic function of time.

(Hutt, 1970, p. 136)

From analysis of the children's responses to her experimental task Hutt (1970) suggests that the categories of investigation and play represent distinctively different behavioural functions. The distinction is linked by Hutt to Berlyne's division between specific and diversive exploration, arguing that diversive exploration is most likely to take the form of play in young children. Hutt (1970) suggests in her conclusion that the distinction between specific and diversive exploration needs further formalization if it is to provide a coherent framework for experimentation.

Generally the performance measures of curiosity have not been

designed to allow discrimination between different forms of exploratory behaviour, although there have been some attempts to recognize its importance. Wohlwill (1975) following theories of Schachtel (1959) and Klein (1963) has argued that young children's voluntary tactual exploration is directed more to affective arousal and satisfaction than to the acquisition of information about the stimulus object. Hence it is more akin to diversive exploration than to the specific exploration which it is assumed to index. To distinguish these two types of behaviour Wohlwill (1975) used two measures, voluntary exploration and stimulus preference.

Wooden shapes with different numbers of sides to represent five levels of complexity were used in a study with Kindergarten, Grade 3, and Grade 6 pupils. Two separate measures of tactile exploratory behaviour were recorded. Pupils were instructed to feel each shape for as long as they wished with one hand and then to signal when they wanted to go on to the next shape. The time spent with each shape was recorded as a measure of voluntary exploration. For the preference measure pupils were given one shape in each hand and asked to indicate which they liked best. The latency of the preference judgment was also recorded. The critical assumption behind this measure is that exploration of the stimuli is directed to gaining information about them preliminary to the expression of a preference for one of the stimuli.

Wohlwill (1975) found:

The voluntary exploration and preference functions were fairly similar, both showing overall increases with complexity. This trend is most strongly in evidence for the oldest group, for which both functions rise steeply and linearly. The corresponding

functions for the Third Graders are more irregular and less steep, but still give indication of increasing with complexity. The youngest group is the only to show the inverted-U shaped preference function which has been so frequently encountered with visual as well as auditory patterns, in both adults and children. This function contrasts with the linear rise exhibited by the exploration time data for this group, thus seeming to bear out in this case the differentiation between preference and voluntary exploration encountered in previous research... the exploration time function, though linear in form, is relatively flat for this youngest group, pointing to a much lesser degree of response to complexity than that exhibited by the older children.

(Wohlwill, 1975, p. 166)

Wohlwill's findings illustrate the difficulty involved in interpreting exploration time measures of exploratory behaviour, especially those recorded from very young children.

Another example of a study which has undertaken a careful examination of the meaning of measures of exploratory behaviour is that reported by Switzky, Haywood and Isett (1974). The study was mainly concerned with the measurement of specific exploration and distinguished six different forms of exploratory activity which might be applied to the three-dimensional random polygons presented to the 2-7 year old children participating. The specific exploratory behaviours distinguished were: touch alone, holding, holding and mouthing, slow exploration, fast exploration, and looking alone. A further discrimination was made between these categories and two forms of play: sensorimotor play and symbolic play. Such measures recognize important differences within exploratory behaviour, differences which are masked by the more global exploration time, or total number of activities measures used in earlier studies.

Weisler and McCall (1976) reviewing the use of the concepts

exploration and play have suggested that they are closely linked in the literature with concepts of specific and diversive exploration.

They concluded that:

The principal feature of exploration is that it is rather dominated by and focused toward the current stimulus situation. Implicitly guiding the behaviour is the question, What is this and what can it do?

(Weisler & McCall, 1976, p. 493)

Play is not predominantly associated with acquiring information about the stimulus context; the behaviour is likely to be stimulus appropriate but not stimulus dominated. Rather, play derives more from the intrinsic dispositions of the organism than from the organism's assimilation of the environment.

(Weisler & McCall, 1976 pp. 493-494)

The distinction between exploration (investigation) and play is then substantially the same as that between breadth of interest and depth of interest dimensions of curiosity. There is some evidence that the performance measures used in experimental studies of curiosity are coming to distinguish between these different styles of activity and motivation.

Teacher Ratings. A second type of measure which has been widely used in the measurement of curiosity in children is that of a teacher's rating. Maw and Maw (1961) and Maw (1964) have developed a Teacher Rating measure of curiosity; and this measure, developed for use with Grade 5 pupils, has been used very widely in studies concerned with curiosity in children. Many researchers who have developed their own measures of curiosity have used the Maw and Maw Teacher Rating as a marker test to evaluate the usefulness of their own instruments (e.g, Coie, 1974; Langevin, 1971; 1972; Medinnus & Love, 1965; Minuchin, 1971).

Teachers were asked to rate a given class of pupils on the basis of a four point definition of the curious child.

1. Reacts positively to new, strange, incongruous, or mysterious elements in his environment by moving toward them, by exploring them or by manipulating them,
2. exhibits a need or a desire to know more about himself and/or his environment,
3. scans his surroundings seeking new experiences,
4. persists in examining and exploring stimuli in order to know more about them.

(Maw & Maw, 1961, p. 299)

Teachers were asked to make the ratings by compiling a list of their pupils in order of the degree to which they manifested the behaviour as set out in the definition. The list was to be completed by noting the two extreme cases one of high and one of low curiosity, and then from these alternately working through to the middle. The curiosity ratings arrived at by this method provide relative scores within a given class group.

The rating criteria set out by Maw and Maw include elements of both breadth and depth of interest dimensions with the latter predominant. Of the four points in their definition points 2 and 4 refer to a depth of interest dimension, point 3 to the breadth of interest dimension, and point 1 could be argued to have elements of both. The ways in which these different aspects are combined, weighted and/or balanced in making the ratings is left unclear. This criticism has recently (Maw & Maw, 1978) been acknowledged by them.

Additional peer and self rating schemes were also developed by

Maw and Maw (1961) but these have not been used as widely as the Teacher Rating. In the peer rating system pupils were asked to evaluate their peers on a Who-Should-Play-the-Part Test. Eight role descriptions were set out, four of the children whose behaviour could be said to represent high curiosity, four low in curiosity. Each child was required to select children from their class who were "generally most like the characters required for the play" (Maw & Maw, 1961, p. 300).

The role descriptions are illuminating in that they specify a particular set of behaviours as a prototype for high and low curiosity and thereby present an implicit weighting of the four points listed in the definition provided for the Teacher Ratings. The role for the high curiosity part is very much a description of behaviour consistent with the depth of interest dimension and includes behaviours which are clearly instances of points 2 and 4. Point 3 of the definition, seeking novelty, is not represented.

Part 1. This part will be played by a classmate who keeps working for a long time trying to understand anything new which can be examined. This pupil sticks to problems trying to solve them. This member of the class is the last to give up when the class is looking for answers to questions. This pupil keeps asking questions after everyone else has stopped and will remain working on strange things after others are done. This child often takes things apart, but will work a long time to put them together to find out how they work.

(Maw & Maw, 1961, p. 300)

Part 8, the low curiosity part, presents a description which is the antithesis of both breadth and depth of interest dimensions.

Part 8. This part will be played by a pupil who misses seeing the things that other members of the class see

easily. The pupil is not easily disturbed by things that happen in the classroom. When something new or strange is brought into the classroom, this classmate often does not look at it or just gives it a slight glance.

(Maw & Maw, 1961, p. 300)

The self-rating measure was developed as a questionnaire presenting statements about habits and attitudes and provided the respondent with a four point response scale: never, sometimes, often, always. Items were of the form:

I keep away from strange and unusual things.

I like to discover new things.

(Maw & Maw, 1961, p. 300)

This measure is basically of the same type as the other self-report questionnaires considered in the next section.

Ratings of curiosity, whether it be by teachers or peers, have been based on a global specification of curiosity. They therefore are subject to the same interpretation difficulties as those encountered with many performance measures. Insufficient discrimination is made between different styles of curiosity behaviour.

Self-Report Questionnaires. The self-report questionnaires used to measure curiosity in children generally consist of a number of statements outlining different situations and the child is required to indicate the degree to which that statement represents their interests.

Langevin's (1971, 1972) Experiential Curiosity Measure A

presented a list of 40 items which 6th graders might be "interested in experiencing". Each item required a three point rating response: want to experience very much, somewhat, not at all. An individual's score was calculated by summing ratings over all 40 items. The items included such statements as:

I want to see a close-up picture of a snowflake.

I want to touch an African garment.

(Langevin, 1972, pp. 117-118)

The Children's Reactive Curiosity Scale (Penney & McCann, 1964) consists of a set of 100 items requiring a TRUE/ FALSE response. From these a short form of 40 items was developed by selecting out those items discriminating between the extreme scoring groups. Inspection of the items indicates that a high score requires responses showing a preference for varied and changing experience.

I like to hear other people tell about things they have seen or done.

I like to meet new grown ups.

(Penney & McCann, 1964, pp. 325-326)

Questionnaires of this type appear to be concerned with the measurement of a breadth of interest dimension. The focus is on the person's desire to experience change and novelty. A different style of self-report measure can be found in the curiosity T.A.T. developed by Beswick (Note 1). T.A.T stories were scored for curiosity imagery. The curiosity imagery was defined in terms of five principal categories:

Wonder-interest; perceptual investigatory acts;
cognitive acts instrumental in problemsolving;
exploratory role behavior; and a cue-response
sequence.

(Beswick, Note 1, p. 3)

These categories are firmly based in Beswick's presentation of curiosity as a "predisposition to create, maintain and resolve conceptual conflicts" (Beswick, 1974, p. 16), and are measuring a dimension which is very similar to what, in this presentation, has been referred to as depth of interest curiosity.

Relationships between the Measures

Studies of curiosity in children which have considered the relationships between measures have generally included a wide variety of test types within their design. The findings of three of these will be discussed here. Their pattern is typical of others.

Working with preschool children Medinnus and Love (1965) intercorrelated four measures of curiosity as part of a study concerned with examining the relationship between curiosity and security. They used the following measures:

1. a teacher rating (after Maw & Maw, 1961);
2. a manipulation task: this was similar in design to the Object Curiosity Test of McReynolds et al. (1961) and provided scores based on the number and type of manipulation of the objects, together with the total manipulation time;
3. a curiosity of the unknown measure: the child chose to play with "known" (on view) or "unknown" (not on view) toys, and the score consisted of the number of unknown toys chosen;
4. curiosity in a choice situation measure: the child was required to choose between approach and avoidance of a hypothetical situation involving uncertainty. The score consisted of the number of approach choices.

When intercorrelated the scores from these measures yielded only one statistically significant coefficient. This correlation of .64 was between the time and manipulation scores on the object manipulation test. The overall finding of no correlation between scores from the different measures is typical for such studies.

Coie (1974) examined the consistency of scores from teacher ratings of curiosity and scores derived from performance tasks. A box apparatus (described earlier) and a bird display were used as non-sanctioned exploration situations. The children encountered the novel stimuli when they were waiting to participate in another experimental task. In a further two situations, a chemicals task and an inclined plane task, the children were presented with the problem and asked to work out a solution (sanctioned situations).

Coie (1974) found:

1. The correlations between curiosity measures were greatest for within situation measures, and low but positive (except for one sanctioned situation correlation) for within type of situation measures. In no cases were the sanctioned and non-sanctioned situation measures significantly correlated.
2. Teachers' curiosity ratings of boys reflected only differences in intellectual performance: those viewed as more curious are more intelligent.
3. In addition to displaying greater intellectual proficiency, those girls rated as more actively curious by their teachers actually were more active in their investigation of the adult-sanctioned situations.

(Coie, 1974, p. 110)

Again it is clear that the different forms of measurement are testing different and generally unrelated aspects of curiosity behaviour.

Langevin's (1971, 1972) study of the relationships between curiosity measures provides an important contribution in that having demonstrated the separation between the measures it suggested what has been proved to be a useful scheme to represent and understand those differences.

The following curiosity measures were included in the study:

1. Test of specific curiosity (Day, 1968c)
2. Test of reactive curiosity (Penney & McCann, 1964)
3. Teacher rating (Maw & Maw, 1964)
4. Berlyne figures: Interest in complexity (Day, 1968c)
5. Experiential curiosity measures ECM curiosity A, B, and C.

The ECM curiosity scores consisted of:

ECM curiosity A: a 40 item self-report questionnaire
ECM curiosity B: exploration time for chosen items
ECM curiosity C: number of questions about chosen items.

Factor analysis of the curiosity scale scores together with measures on variables of sex, age and intelligence indicated that the test of specific curiosity (Day, 1968c), the test of reactive curiosity (Penney & McCann, 1964) and the ECM curiosity A scale loaded on the same factor. The ECM curiosity B and C loaded together on a separate factor. The first factor was described as a breadth of interest curiosity factor, the second as a depth of interest curiosity factor.

One feature of these findings which has not yet been referred to concerns the relationship between the three self-report scales. All

have items concerned with the desire to experience the novel and unusual. The Reactive Curiosity Scale and the ECM Curiosity A scale have been described earlier. Day's test is called a test of Specific Curiosity. The set of items has not been published but Langevin (1971) when discussing his findings suggested that 25 percent of the Day items are very similar to the items on the Reactive Curiosity scale. Day's (1968a) description of the scales presents it as one:

Designed to measure specific curiosity, that is a tendency towards an approach and exploratory response in the presence of a specific stimulus which is high in collative variability (e.g., novelty, ambiguity). This 36-item questionnaire actually covers a very large number of sensory modalities (e.g., visual, gustatory, olfactory, auditory) interests (e.g., newspapers, caves, classroom projects) and response modes (e.g., asking questions, looking up information, listening).

(Day, 1968a, p. 491)

This description of specific exploratory behaviour has much in common with the first point of the Maw and Maw definition of curiosity ("reacts positively to new, strange, incongruous, or mysterious elements in his environment by moving toward them, by exploring them or by manipulating them") (1961, p. 299). The characteristic of approach behaviour in the presence of novel stimuli is common to both breadth and depth dimensions of curiosity, it is the form taken by the approach behaviour which sets them apart. The close investigation typical of the depth of interest dimension is distinctly different to the seeking of variation and change which is characteristic of the breadth of interest dimension.

Langevin (1971, 1976) questions the validity of this two factor pattern suggesting that it may be an artifact of the test forms: pencil-and-paper tests factoring out from the performance tests. A

recent study by Henderson and Moore (1979) found evidence of breadth and depth factors within performance tasks, more specifically different measures within the same task situation. The task involved was described as a curiosity drawer box.

It provided a standardized situation in which the child could manipulate and ask questions about moderately novel objects. The box had 18 drawers, each of which contained a small toy (e.g., airplane, flashlight, ring). The child was invited to open the drawers and play with the toys inside for as long as he/she wanted to. Dependent measures were number of questions asked, number of manipulations (maximum score of 54), median time spent with toys, total time spent with toys, number of toys taken out of drawers, number of drawers opened but no toy taken out, and a "search" score (the frequency of opening adjacent drawers in order). Only the child's first opening of a given drawer and the subsequent questions and manipulations of the toy were scored.

(Henderson & Moore, 1979, p. 114-115)

For each of the three groups in the study the measure with the highest loading on the breadth factor was the number of toys taken out of drawers. Other measures loading with this were the number of manipulations, and for two of the groups, the "search" score. The measures with high loadings on the depth factor were the time measures.

Summary

Three types of curiosity measure have been widely used in studies of children's curiosity: performance tasks, teacher ratings, and self-report questionnaires. In the performance tasks reviewed a particular novel stimulus, or set of stimuli, was presented and the child's

response recorded. Length of time to approach the stimuli, number of manipulations, number of questions, information gained, have all been used to index curiosity.

It has been argued that such measures have generally overlooked important qualitative differences in behaviour. Where there has been acknowledgement of such differences they have been characterized in terms of the difference between exploration and play, and from there linked to Berlyne's distinction between specific and diversive exploration. Hutt (1970) has suggested that to be useful in guiding research into curiosity the distinction between specific and diversive exploration needs further formalization.

The important distinction between types of curiosity behaviour indicated by the performance task studies reviewed is substantially the same as that which has been described in Section I as the difference between breadth of interest and depth of interest curiosity. Examination of the constructs of curiosity implicit in the teacher ratings and the self-report scales has also shown the usefulness of the breadth of interest and depth of interest formulation in distinguishing the different forms of behaviour grouped together by their common aspect of involving approach to novelty.

Three studies which have looked at the relationship between examples of these main types of curiosity measure have been outlined. Their general finding of a low positive correlation between the measures is typical of the findings of such studies. It has been argued that such results point to the conclusion that the different

forms of measurement are testing different and generally unrelated aspects of curiosity behaviour.

The results of Langevin's (1971, 1972) study of the relationships between measures of curiosity indicated two different curiosity styles which he later dismissed as artifacts of the measurement forms. However, examination of these two curiosity styles, consideration of their similarities with the distinction between exploration and play, specific and diversive exploration, together with the theoretical underpinning of a theory such as differential emotions theory, suggests that they can provide a suitable framework for synthesis of present research findings and provide direction for further investigation into children's curiosity.

Measurement of Curiosity in Adults

Development of curiosity scales for adults has generally been more closely tied to a particular theoretical stance than in the case of children's measures. Those measures that have been developed have largely been self-report trait measures designed to operationalize the central construct of a particular theoretical system.

A selection of adult scales is described indicating the type of curiosity construct involved and the particular theory from which it is derived. Most of the scales can be readily sorted into one of two groups matching the breadth of interest and depth of interest

distinction. Some contain a number of subscales and among the subscales both groups are sometimes represented. The majority of the scales have been developed from optimal arousal theories, especially the theoretical propositions advanced by Fiske and Maddi (1961).

A Selection of Scales

Desire for Novelty: T.A.T. Following Fiske and Maddi's (1961) theoretical propositions about the need for variety (see Chapter Three), Maddi, Propst and Feldinger (1965) argued that the need for variety could be considered a general characteristic of personality integrating a number of more discrete dimensions of behaviour. They suggested that there are at least four dimensions of behaviour which are expressions of the need for variety. The first, a tendency to change one's responses from moment to moment had been studied extensively by Fiske (1961).

The three dimensions remaining for study are the tendencies to produce novelty (this implies self-gratification), have curiosity (this indicates a search for new information), and feel the desire for novelty (this indicates that variation in stimulation is rewarding for the person). It would seem most common for the interaction between a person's need for variety and the other aspects of his personality and abilities to result in the predominance in him of one or another of these dimensions.

(Maddi, Propst & Feldinger, 1965, p. 83)

Measures of these three aspects of the need for variety were developed using a standard T.A.T. format. Four pictures were used and the stories generated were scored for expression of the tendencies to produce novelty, to have curiosity, and to feel the desire for

novelty.

Novelty of productions was scored in terms of unusual or infrequent images relative to the person's subculture. Curiosity was scored by determining "the degree to which a story expresses the process of asking questions, or posing problems and attempting to obtain new, additional information with which to resolve the perplexities" (Maddi et al., 1965, p. 86). This dimension is clearly one of depth of interest curiosity. Desire for novelty was suggested as finding expression in "appreciation of roller coaster rides, and jokes, and preference for, rather than production of, complexity" (Maddi et al., 1965, p. 95). Such a description of the "desire for novelty" is strongly suggestive of the breadth of interest curiosity dimension.

Because T.A.T. measures are more difficult to administer and score than are the more conventional questionnaires this measure has not been used very widely.

Change Seeker Index. The Change Seeker Index was developed to provide a practical procedure for assessing individual differences in the need for stimulus variability. The basic theory behind this test again is a form of optimal arousal theory of curiosity and is very similar to that of Fiske and Maddi (1961). Garlington and Shimota (1964) proposed that:

Not only do all humans require some stimulus variability, but also that the optimum amount of stimulus variation necessary for effective functioning differs from one person to another. We believe that Change Seeking, the need for variation in one's

stimulus input in order to maintain optimum functioning, is a measurable dimension of behavior and one that is reflected in certain personality characteristics.

(Garlington & Shimota, 1964, p. 919)

The scale developed consisted of 95 items requiring a TRUE or FALSE response. Items indicating a high level of change seeking include statements such as:

I like to feel free to do what I want to do.

Because I become bored easily, I need plenty of excitement, stimulation and fun.

Items scored in the opposite direction are:

I like to follow instructions and do what is expected of me.

I like to complete a single job or task at a time before taking on others.

The score is calculated as the total number of items answered in the change seeker direction. The style and content of the test items as well as the description of the Change Seeker suggest that this test is assessing a breadth of interest curiosity dimension.

Novelty Experiencing Scale. Like Maddi et al. (1965), Pearson (1970) argues that human novelty seeking or exploratory behaviour is not necessarily a unitary construct but contains smaller "more conceptually homogeneous parts" (p. 199). Novelty seeking was defined as:

A tendency to approach versus a tendency to avoid novel experiences. It is a disposition toward changing, new or unexpected experiences versus a disposition to avoid these experiences.

(Pearson, 1970, p. 199)

Pearson (1970) suggests that within this tendency to approach novel experiences there are important differences of kind based on the source of stimulation, either internal or external to the person, and the type of experience classified as either sensation or cognition. This analysis yields four different forms of the tendency to approach novel experiences: external sensation, internal sensation, external cognition, and internal cognition.

Four subscales each representing one of these areas were constructed and together constitute the Novelty Experiencing Scale. Each subscale consists of 20 statements and the respondent is required to indicate for each LIKE or DISLIKE. The score consists of the total number of items marked LIKE. Items which make up each subscale were constructed to meet the following criteria:

(a) External Sensation - a tendency to like (vs. a tendency to dislike) active, physical participation in "thrilling" activities.

(b) Internal Sensation - a tendency to like (vs. a tendency to dislike) the experience of unusual dreams, fantasy or feelings which are internally generated.

(c) External Cognitive - a tendency to like (vs. a tendency to dislike) finding out facts, how things work, and learning how to do new things.

(d) Internal Cognitive - a tendency to like (vs. a tendency to dislike) unusual cognitive processes which are focussed on explanatory principles and cognitive schemes.

(Pearson, 1970, p. 201)

The distinction which Pearson (1970) makes between the cognitive and sensation subscales is an interesting one in that it focuses on

the central difference between the breadth and depth of interest dimensions of curiosity. The activities associated with the cognitive subscales involve a close investigation of the novel experience or object, while for the sensation subscales, as the title implies, the focus is on experiencing change and variation. However, the Internal Sensation subscale is conceptually ambiguous: are "internal sensations" as they appear in the test items sensations or ideas?

As an adjunct to the Novelty Experiencing Scale, Pearson (1970) developed a Desire-for-Novels Scale purporting to measure "the wish for new experience and acknowledgment of the boring nature of the status quo" (p. 201). The scale consists of 10 statements (e.g., "I feel that life is boring" and "I often wish life were more stimulating"). Respondents were required to circle LIKE ME or UNLIKE ME according to how accurately such statements described their feelings.

This scale, while obviously related to the states which motivate some forms of exploratory behaviour, is marked out as different by the absence of any assessment of approach tendencies. Pearson (1970) reported zero correlations between the Desire for Novelty Scale and three of the novelty experiencing subscales. The only subscale which correlated significantly with the Desire for Novelty Scale was the Internal Sensation subscale and in that case the correlation was low and positive (.25). This pattern of results parallels the general finding of orthogonal factors for the "reversed" and "non-reversed" items of anxiety (Gaudry, Vagg, & Spielberger, 1975; Naylor, 1978; Naylor, Elsworth and Astbury, 1980) and curiosity (Naylor, 1981) inventories. It suggests that to indicate a dislike for monotony is

not necessarily on the opposite end of that dimension or dimensions which represent approach to novelty.

Stimulus-Variation Seeking Scale. This test too is based on the conceptual framework proposed by Fiske and Maddi (1961). The scale purports to be measuring exteroceptive stimulation seeking and the "exteroceptive stimulus-variation seeker" is defined as:

(1) one who approaches and explores relatively new stimulus situations, (2) one who approaches and explores incongruous and complex stimuli, and (3) one who responds so as to vary stimulation in the presence of frequently varied stimulation.

(Penney & Reinehr, 1966, p. 631)

The test consists of 100 statements to which the person is required to respond TRUE or FALSE. Items answered TRUE and scored in the stimulus-variation seeking direction consist of statements such as:

I frequently change my work or study schedule.

An element of risk adds to my enjoyment of an activity or event.

The score is the number of items marked in the direction of stimulus-variation seeking. The content of the items with their focus on behaviour which involves seeking variety and change in stimulation clearly suggests that it is measuring a breadth of interest curiosity dimension.

The Sensation Seeking Scale. The first form of the sensation seeking scale (Zuckerman, et al., 1964) was designed to quantify an

individual's characteristic optimum level of arousal. Summarizing the development of the scale Zuckerman (1974) suggested that:

Sensation seeking has been related to an impulsive type of extraversion, to the need for varied experience in many forms of sensation and arousal (sexual, gustatory, perceptual and cognitive), and to the need for new kinds of experience as expressed in volunteering for unusual experiments and projects.
(Zuckerman, 1974, p. 140)

Factor analytic studies of the earliest forms of the scale led to the development of a scale which provides a general sensation seeking score together with scores on four subscales. The four subscales as described by Zuckerman (1975) are as follows:

The Thrill and Adventure Seeking (TA) factor consists of items which express a desire to engage in outdoor sports or other activities involving elements of speed or danger.

The Experience Seeking factor (ES) might be termed a "hippie" factor. Its essence is "experience for its own sake". The factor includes items indicating wanderlust, exhibitionism in dress and behavior, the use of marijuana and hallucinatory drugs, associating with unusual and unconventional persons, a liking of modern arousing music and art, and flouting of "irrational" authority.

The Disinhibition (Dis) factor might also be labelled "Swinger". It consists of items which express the hedonistic "Playboy philosophy": heavy social drinking, variety in sexual partners, "wild parties", and gambling....

The Boredom Susceptibility (BS) factor in males contains items indicating a dislike of repetition of experience, routine work, predictable, dull or boring people, a preference for exciting people, and variety; and a restlessness when things are unchanging.
(Zuckerman, 1975, p. 3)

The items on the scale are of a forced choice form, and the respondent is instructed to indicate which of a pair of statements

most describes "your likes or the way you feel". The pairs of statements for each item are claimed to be of comparable social desirability.

Zuckerman's description of the general construct of sensation seeking and of the four factors, especially Thrill and Adventure Seeking (TA) and Experience Seeking (ES), bear a strong resemblance to the breadth of interest curiosity dimension.

The Ontario Test of Intrinsic Motivation. In Chapter Two mention was made of Day's analysis of curiosity as a personality trait and of the scales he has developed to measure specific curiosity and to a much lesser extent diversive curiosity. This formulation derives most of its theoretical base from the work of Berlyne whose contribution to the development of an optimal arousal theory of curiosity was detailed in Chapter Three.

From his specification of the characteristics of the specifically curious person a three dimensional model was constructed.

The first face of the cube was based on the principle of specificity and was divided into interest areas adopting the categories of the Kuder Preference Record (Vocational) (Kuder, 1939). The second face was another form of specificity and divided the sources of stimulation into three of the collative variability categories - novelty, ambiguity and complexity....

The final face of the cube reflected the manner of response... Three types of response were identified: consultation, including question-asking, library research, etc.; observation, including attention, manipulation, etc.; and thinking, which represents internalized activities that lead to an understanding of a situation by collating, reassessing, or

reorganising incoming information with that already in
cognitive storage.

(Day, 1971, pp. 109-110)

The scale has 90 items measuring specific curiosity, one representing each combination of the source of stimulation x interest area x manner of response divisions.

I enjoy trying to identify old themes in new songs.
(novelty x musical interest x thinking)

If I were reading a travel book I would keep a map
beside me.
(complexity x literary interest x consultation)

In keeping with Day's analysis of the specifically curious person such items appear to be measuring a depth of interest curiosity dimension.

In the construction of the OTIM, diversive curiosity has been represented as a separate ten item scale alongside the 90 specific curiosity items and another ten social desirability items. The items measuring diversive curiosity consist of statements concerned with a desired level of change in stimulation.

I soon get bored when there is not enough going on.

I get tired of doing the same thing all the time.

The behaviour described by these items generally concerns feelings of boredom and restlessness when confronted with sameness. They generally emphasize wanting to escape monotony and only one or two items give any suggestion of approaching novel experience. In this the scale is closer to Pearson's (1970) Desire for Novelty Scale with

its emphasis on boredom, than to the bulk of novelty seeking and sensation seeking scales which all focus on approach to novel experience. Since this is the case, the diversive curiosity items, which would on the basis of theory be expected to measure a dimension consistent with breadth of interest curiosity, may not in fact be operating as intended. Avoidance of monotony, as was indicated with Pearson's (1970) Desire for Novelty scale, is not necessarily on the opposite pole of an approach to novelty dimension.

Test of Intrinsic Motivation. The development of this test was based on Beswick's "cognitive process" theory of curiosity in which he defines curiosity as "a predisposition to create, maintain and resolve conceptual conflict" (Beswick, 1974, p. 16). The 16 items on the test were collected together from a number of different sources including the OTIM, an openness to experience measure, and Cattell's (1957) erg factor. Items were selected to fit the curiosity imagery defined in an earlier T.A.T. measure for children (Beswick, 1964).

Three response categories are provided for each item statement: "true, and typical of me", "often or sometimes true of me", "not true for me". The items consist of statements such as:

If I read something which puzzles me, I keep reading until I understand it.

If I come across something interesting I drop everything and study it. It is never a waste of time.

With its emphasis on approaching particular problems, and engaging with them until a solution is achieved, this test is clearly

looking at a depth of interest curiosity dimension.

Melbourne Curiosity Inventory. The Melbourne Curiosity Inventory (Naylor, 1981) consists of a state-trait inventory of curiosity in a form analogous to that of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970). The trait scale consists of 20 statements requiring a response in terms of the extent to which the statements describe how the respondent generally feels: "almost never", "sometimes", "often", "almost always". Items are of the type:

I think learning "about things" is interesting and exciting.

I want to probe deeply into things.

Generally they express an interest in exploring and finding out about the novel and problematical. Hence they are of the depth of interest type.

The state scale consists of a similar 20 items but with the emphasis on response in terms of the person's feelings about their present state.

A Summary Grouping

A summary classification of the tests which have been described is provided in Table 5.1. The groupings are in terms of the similarity of each test, or in cases where there are a number of subtests, of each subtest, to the breadth of interest and depth of interest dimensions.

They have been arrived at by considering both the content of the items in each scale and the particular theoretical orientation guiding each scale's construction.

Most tests fit easily into one of the two dimensions of this classification. One scale, Pearson's (1970) Internal Sensation scale, on the basis of its construct description fits into the breadth of interest category. However, consideration of some of the item content suggests that at times the distinction between sensations and cognitions is a rather tenuous one: e.g., "Having a dream in which I lived in England in an old, haunted castle".

Relationships between the Scales

The research data on relationships between the scales are generally consistent with the groupings shown in Table 5.1. Studies linking the tests classified as depth of interest scales are rare. Beswick (1974) reports a .70 correlation between his Test of Intrinsic Motivation and the full OTIM from which some of the items were derived. In contrast quite a number of studies have been reported in which scales classified here as breadth of interest scales have been correlated together. The results of these studies have been summarized in Table 5.2. As can be seen from the table the correlations have generally been of the order of .60 - .70. The one exception to this pattern is the SSS/NES (Internal Sensation) correlation (Pearson, 1970). When the SSS was broken down into its four subscales and male and female respondents data analyzed separately, as was reported by

Table 5.1
Classification of Curiosity Styles Represented in the Adult Scales

Depth of Interest	Breadth of Interest	Source
*T.A.T. Curiosity	*T.A.T. Desire for Novelty	Maddi et al.(1965)
	*CSI Change Seeker Index	Garlington & Shimota (1964)
*NES Novelty Experiencing Scale	*NES	Pearson (1970)
- External Cognition (EC)	- External Sensation (ES)	
- Internal Cognition (IC)	- Internal Sensation (IS)	
	*SVSS Stimulus-Variation Seeking Scale	Penney & Reinehr (1966)
	*SSS Sensation Seeking Scale - Thrill and Adventure (TA) - Boredom Susceptibility (BS) - Experience Seeking (ES) - Disinhibition (Dis)	Zuckerman (1975)
*OTIM Ontario Test of Intrinsic Motivation - Specific Curiosity (SC)	- Diverse Curiosity (DC)	Day (1969)
*IM Test of Intrinsic Motivation		Beswick (1974)
*MCI Melbourne Curiosity Inventory		Naylor (1981)

Zuckerman (1975), the pattern is more complex. The correlations for the females generally were higher than those for the males. The SSS/Internal Sensation correlations where significant were only small, and the SSS/External Sensation correlation had a strong thrill and Adventure Seeking component.

Some of the studies (Pearson, 1970; Zuckerman, 1975) also include correlations between scales classified as measuring a breadth of interest dimension and scales measuring a depth of interest dimension. Pearson (1970) reported nonsignificant correlations between all the subscales of the Novelty Experiencing Scale except for Internal Sensation/Internal Cognition (.36, $p < .01$), and Internal Cognition/External Cognition (.50, $p < .01$). She also reported very low correlations for each of the two cognition subscales of the Novelty Experiencing Scale when set against the Sensation Seeking Scale (Zuckerman et al., 1964). In the results reported by Zuckerman (1975) the only significant correlation between the cognition subscales of the Novelty Experiencing Scale and the Sensation Seeking subscales was $-.35$ ($p < .05$) between Disinhibition and External Cognition.

The pattern of empirical relationships between the scores on these scales as reported in the literature does not provide support for the notion of a general factor of curiosity. A general factor would require strong intercorrelations between all the scales. The pattern is, however, consistent with a two factor formulation, and it is suggested that these groupings can best be represented as breadth of interest and depth of interest factors.

Table 5.2
Reported Correlations: Breadth of Interest Scales

Scales	Studies	r^a	
SSS X	McCarroll, Mitchell, Carpenter & Anderson (1967) - two samples	.62	.60
SVSS	Looft and Baronowski (1971)	.66	
SSS X	McCarroll et al. (1967) - two samples Acker & McReynolds (1967) Farley (1971)	.66 .62 .63	.70
CSI	McReynolds (1971) Looft & Baronowski (1971)	.68 .67	
		ES	NES IS
SSS X	Pearson (1970) Zuckerman (1975)	.68	.20
		Gen SSS	/.35 ^b
		TA	/.35
NES (Sensation subscales)		ES	.31/.35
		Dis	/.30
		BS	/.33

^aOnly significant correlations included ($p < .05$).

^bMales/females.

Concluding Summary

In this chapter the wide range of assessment forms which have been used in research on curiosity in both children and adults have been reviewed.

Measurement of curiosity in children has employed three main assessment forms: performance measures, teacher ratings, and self-report scales. Construction of these measures has often been pragmatic rather than adhering closely to any particular theoretical system. The upshot of this, most notably in the area of performance measures, has been insufficient attention to qualitative differences between the activities from which the scores derive. Studies investigating the relationship between measures of curiosity in children have generally found only very small overlap between those measures.

Measures of curiosity in adults have typically taken the form of self-report questionnaires, and are more likely to have been developed in an attempt to operationalize the central construct of a particular theoretical system. Most of the scale development research reports have included some indication of how that scale relates to several other scales and putting all of these results together has made it possible to draw some conclusions about the constructs being sampled by these scales.

Neither the results from the research reports based on the

measurement of curiosity in children or that concerning the measurement of curiosity in adults supports the notion of curiosity as being a unitary construct. For the latter to be the case there would need to be a pattern of strong correlations between the different scale scores, and clearly this has not been the case. As has been argued, a two factor construct would seem to provide a more appropriate explanation of the pattern of research findings.

Curiosity is in essence approach to novelty. Consideration of the nature of the items which go to make up the scales which empirically have been shown to go together suggests that a two factor construct subsuming separate breadth of interest and depth of interest components provides a good characterization of the different forms of approach to novelty represented in that item content.

Chapters Six, Seven, and Eight in this section report the results of a number of research studies which have been concerned with the construction and validation of a scale which measures both breadth and depth of interest curiosity styles.

CHAPTER 6

THE DEVELOPMENT OF A TWO FACTOR SCALE OF CURIOSITY

Overview. In the previous chapter a review of the forms of measurement used for assessing curiosity in children and adults was undertaken. From this review it was concluded that curiosity is not a unitary construct. There is no evidence to support the concept of a general factor of curiosity linking the different measurement forms. Rather, a two factor construct embracing breadth of interest and depth of interest curiosity styles would seem to provide a reasonable fit for the available results. This chapter reports the details of a series of studies designed to test that proposition through an empirical analysis of the structure of existing measurement scales and the development of a new scale which incorporates both breadth of interest and depth of interest dimensions.

Three studies are reported. In the first study a selection of scales which have been used in the assessment of curiosity in adults was administered to a group of teacher education students. Factor analysis of the scores from these scales indicated a two factor solution consistent with the breadth of interest and depth of interest curiosity formulation. The second study reports the development of a new scale designed to measure each of the two factors. This scale was developed by assembling together items from the original scales which correlated most strongly with the breadth and depth factors. The final study reports the results of a cross-validation in which the new two factor scale was administered to a new group of college students. The scores were again factored and the results confirmed the predicted two factor structure of this scale. The resulting 40 item scale: the Two Factor Curiosity Scale, was also shown to have sound psychometric properties.

Langevin (1976) argued that one of the main reasons studies comparing curiosity measures have generally found low correlations between scales is that the scales themselves have serious psychometric deficiencies. Earlier (Langevin, 1971) he had suggested that the breadth and depth factor labels were at best tentative and could well

be equivalent to a performance measures versus a pencil-and-paper scales difference. Hence, any new scale purporting to distinguish between breadth and depth factors must have sound psychometric properties. Langevin (1976) described his standard for the internal structure of a good scale in the following way.

Sound tests should have, to some degree, the following properties: normal distributions, no floor or ceiling effects, substantial item-test (part-remainder) correlations, high alpha reliability (KR 20 >.60; Nunnally, 1967) and a large single test factor.
(Langevin, 1976, p. 256)

Along with the poor psychometric properties of curiosity scales Langevin (1976) suggested that their usefulness was severely limited because they had not been shown to be measuring something distinct from other constructs such as social desirability, intelligence and anxiety. These relationships are also considered in the development of the new scale.

Three studies are reported in this chapter:

- Study 6.1: The factor structure of curiosity scales.
- Study 6.2: Construction of a two factor measure of curiosity.
- Study 6.3: Cross-validation of the new scale.

Study 6.1: The Factor Structure of Curiosity Scales

Aim

To examine the validity of the breadth of interest and depth of interest classification of curiosity styles through an analysis of the

factor structure across a number of curiosity scales.]

Method

A large number of scales measuring curiosity and related constructs has been reported in the literature. A selection of these measures was described and discussed in Chapter Five. From these, five scales were chosen to represent the type of items and content which have been used to measure curiosity in adults. All of those chosen were pencil-and-paper self-report scales. This was done to eliminate the problem Langevin (1971) found of distinguishing curiosity styles from measurement forms.

The scales selected were:

Test of Intrinsic Motivation (Beswick, 1974)
 Ontario Test of Intrinsic Motivation (Day, 1971)
 Melbourne Curiosity Inventory - Trait Form
 (Naylor, 1981)
 Novelty Experiencing Scale (Pearson, 1970)
 Sensation Seeking Scale (Zuckerman, 1975)

This particular selection of scales provided 13 (12 curiosity and 1 social desirability) separate scale or subscale scores. Table 6.1 lists these scales and indicates which of the two curiosity styles, breadth of interest and depth of interest, it appears to be testing. Copies of these scales as reproduced for the testing programme are set out in Appendix A.

The tests were administered to 227 teacher education students from two different tertiary colleges. The group from Location 1 consisted of first year Psychology students at a city college. The group from Location 2 were third year teacher education students from

Table 6.1
Classification of Curiosity Style for Five Curiosity Scales

Scale	Symbol	Number of items	Curiosity Style
*Test of Intrinsic Motivation	IM	16	Depth
*Ontario Test of Intrinsic Motivation	OTIM		
<u>subscales:</u>			
- Specific Curiosity	OTIMSC	90	Depth
- Diverive Curiosity	OTIMDC	10	Breadth
- Social Desirability	OTIMSD	10	
*Melbourne Curiosity Inventory - Trait Form	MCIT	20	Depth
*Novelty Experiencing Scale	NES		
<u>subscales:</u>			
-Internal Cognition	NESIC	20	Depth
-Internal Sensation	NESIS	20	Breadth
-External Cognition	NESEC	20	Depth
-External Sensation	NESES	20	Breadth
*Sensation Seeking Scale	SSS		
<u>subscales:</u>			
-Thrill and Adventure Seeking	SSTA	10	Breadth
-Experience Seeking	SSES	10	Breadth
-Disinhibition	SSDis	10	Breadth
-Boredom Susceptibility	SSBS	10	Breadth

a College of Advanced Education in a large country centre. For Location 1 students the scales were administered at the beginning of three Psychology practical classes and the Location 2 students completed the scales during two special one hour testing sessions. The distribution of sex and age characteristics is presented in Table 6.2

Table 6.2
Study 6.1 Group Characteristics: Age and Sex Distributions

Age (<u>Mdn</u> = 20 years)	Male	Female	Total
< <u>Mdn</u>	27	91	118
> <u>Mdn</u>	36	72	108
	63	163	226 ^a

^aAge data for one female student missing.

The ACER Advanced Tests AL-AQ (A.C.E.R., 1955) assessing verbal and numerical abilities had previously been administered to the groups who participated in the testing and these scores were available to be included in the analysis.

AL-AQ scores were available for 203 of the students and this group had a mean score which was equivalent of IQ 115. (See Appendix B for distribution of raw scores and IQ equivalents.)

Results

The means and standard deviations for all of the curiosity scales and subscales were calculated and these are presented in Appendix C. The scores from the curiosity scales were then correlated with the scores from the AL-AQ general intelligence measure. The correlations (Appendix D) were all close to zero. The scale which had the largest correlation with the intelligence measure was the External Sensation Scale (SSES) with a correlation of .21, $p < .001$. The curiosity scale scores were generally unrelated to measured intelligence.

The scores from each curiosity scale were then entered as variables in a factor analysis using the SPSS method of principal factoring with iteration (Nie, Hull, Jenkins, Steinbrenner, & Brent, 1975). The first three factors had eigen values greater than one and accounted for 29.2, 17.2, and 9.1 percent of the total variance respectively. The correlation matrix and table of principal factors is presented in Appendix E. Clearly this result does not indicate a general factor of curiosity.

A scree test (Cattell, 1966, 1978) suggested rotation of two factors (see Figure 6.1), while application of Kaiser's rule (Rummel, 1970) indicated a rotation of three factors. Rotations of two and three factors were performed. The results from the two factor rotation are presented in Table 6.3 and the results for the three factor solution appear in Appendix E.

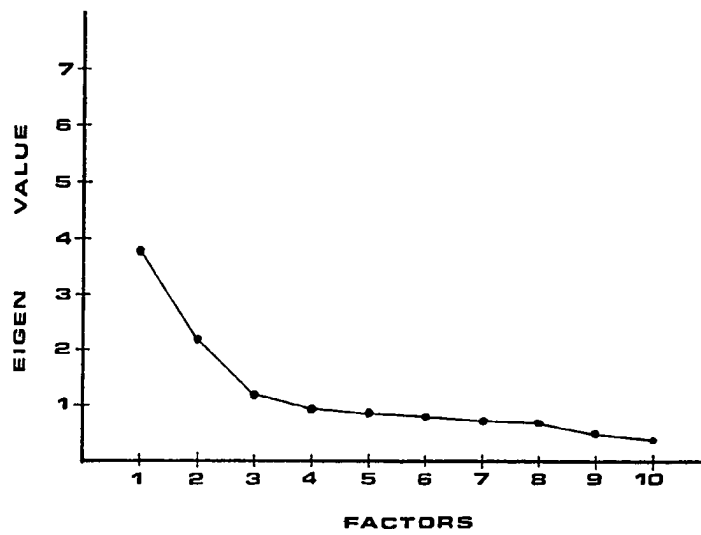


Figure 6.1 Scree plot of factors: Curiosity scales.

Inspection of these factor solutions indicated that a rotation of two factors separated the curiosity scales into two clear groupings. Together Factor 1 and Factor 2 accounted for 46.4 percent of the total variance. Rotation of three factors did not change the basic division between the scales but rather produced a split within factor two separating out two of its scales to form a third factor.

Those scales and subscales with high loadings on Factor 1 (NESIC, NESEC, IM, OTIMSC, MCIT) were all scales which in Table 6.1 were classified as representing a depth of interest curiosity style. They were all scales whose items are concerned with interest in exploration and understanding of new objects, events and ideas. On the other hand those scales which had a high loading on Factor 2 (SSTA, SSES, SSDis, SSBS, NESES, NESIS) were all scales classified as being concerned with a breadth of interest curiosity style. The items on these scales are concerned primarily with seeking out new sensations and experiences. OTIMDC also loaded on Factor 2 but the loading was lower than that for the other Factor 2 scales.

Only one scale, NESIS, appeared on both factors. The loading of this scale on Factor 1 was considerably lower than any of the other Factor 1 curiosity scales. The social desirability scale of the OTIM (OTIMSD) had a small loading with the Factor 1 scales.

The rotation of two factors separated the curiosity scales into two clear groupings: breadth of interest scales and depth of interest scales. Together Factors 1 and 2 accounted for 46.4 percent of the total variance. These same two groupings were maintained when three

Table 6.3
Varimax Rotation of Two Factors: Curiosity Scales^a

Scale	Rotated Factors ^b	
	1	2
SSTA	17	55
SSES	24	58
SSDis	-05	55
SSBS	-16	41
NESES	22	57
NESIC	68	12
NESIS	37	47
NESEC	75	-07
IM	78	05
OTIMSC	71	27
OTIMDC	06	38
OTIMSD	38	-15
MCIT	56	15

Note. Decimal points omitted.

^aThese two factors accounted for 46.4% of the total variance.

^bValues >.29 have been entered in **bold** type.

factors were rotated. The third factor consisted of a division within the previous Factor 2: SSTA and NESES separated out from SSES, SSDis, SSBS, and OTIMDC. This three factor solution did not produce any significant grouping of scales which cut across the two factor solution. From a consideration of these analyses a two factor solution would appear to be the most appropriate solution.

Discussion

These results are consistent with the general pattern of findings reported in the research literature. There was no evidence of a general factor of curiosity. Rather, the factor structure of the test scores indicated that there were two clear groupings within the set of curiosity scales. This suggests that distinguishing between breadth of interest and depth of interest curiosity styles does provide a valid classification of the behaviour measured by existing curiosity scales.

Study 6.2: Construction of a Two Factor Measure of Curiosity

Aim

To construct a scale consisting of two subscales, one measuring breadth of interest curiosity, and one depth of interest curiosity.

Method

The item responses from the 13 scales and subscales used for the analyses presented in Study 6.1 were analyzed to isolate those individual items which had the strongest loadings on each of the two curiosity factors: Factor 1 (F1) depth of interest and Factor 2 (F2) breadth of interest. These items were then used to construct a new scale. Items from the existing scales were used in the construction of the new scale to allow maximum utilization of the known response characteristics of those items.

All of the analyses for this study were based on the two factor rotated solution for the 13 scales and subscales (see Study 6.1). From the factor score coefficients for each scale, factor scores (F1 and F2) were calculated for each student who had completed the set of scales. The correlations between the set of responses for each item and the two sets of factor scores were used as a measure of the degree to which each item was tapping each of the factors (F1 and F2). Those items with the highest item/factor score correlation were used in the construction of a new scale. An additional requirement was that the two new subscales should have a high degree of internal consistency.

Results

Item/factor score correlations. Because each item being correlated with the factor scores (F1 and F2) was used in the analysis from which the factor score coefficients for each scale were derived, it was decided to test the extent of this contamination. This was done

in the following way. The item with the highest item/factor score correlation was isolated: Item 28 on the Novelty Experiencing Scale, which had a correlation of .62 with F1. A new set of F1 scores was computed for all of the students, and in the calculation of this new set the critical item was deleted. The critical item responses were then correlated with the new set of factor scores. This procedure was predicated on the assumption that the item with the highest item/factor score correlation could be expected to contain the largest overestimate of all the item/factor score correlations. Table 6.4 shows the size of the overestimation for this item. Given such a small overestimate on this item (.02), it was reasonable to disregard this element of contamination when using the item/factor score correlations to select items for the new scale.

Table 6.4
Size of Maximum Overestimation Effect in
Item/Factor score Correlations

Factor score Calculation ^a	r^b	Difference
I.28 included	.62	.02
I.28 excluded	.60	

^aInclusion/exclusion of Item 28 from calculation of the factor scores.

^bCorrelation of Item 28 responses with Factor 1 factor scores.

From the original 266 items those with the highest item/factor score correlations for each factor (F1 and F2) were selected to form the new scale. Copies of the original scales and their item/factor score correlations for both F1 and F2 are presented in Appendix F.

Internal Consistency. Twenty-eight items for each factor were selected and grouped into two scales. Internal consistency analyses (RELIABILITY, Hull & Nie, 1979) using the original set of item responses as the data pool, were performed. The item-total correlation results together with the item/factor score correlations were then used to arrive at a short scale made up of two internally consistent subscales (subscale D and subscale B). Table 6.5 presents a summary of these analyses for the final set of 21 items chosen to represent Factor 1 (subscale D) on the new scale, and Table 6.6 summarizes the data for Factor 2 items (subscale B).

Table 6.7 presents a summary of the internal consistency data for the new subscales together with the parent scales and indicates that they have a relatively high level of reliability. All of the values of coefficient alpha in Table 6.7 are those obtained from the data collected in the testing programme described in Study 6.1.

Item format. The response categories for the items on the original scales were in three forms: a two point rating (TRUE/FALSE - OTIM, LIKE/DISLIKE - NES, A/B - SSS), a three point scale ("true, and typical of me"; "often or sometimes true"; "not true for me" - IM) and a four point scale ("almost never", "sometimes", "often", "almost always" - MCIT). Hence, many of the items in the new scale had to be

Table 6.5
 Summary Scale Statistics for 21 Item Subscale D
 (alpha = .87)

Scale	Item	Item/factor score Correlation	Item-total Correlation
MCIT	02	.48	.40
	03	.47	.42
	07	.48	.42
	13	.57	.43
	14	.55	.48
	19	.55	.43
IM	04	.55	.46
	07	.48	.44
	10	.53	.49
	16	.53	.40
NES IC	10	.52	.44
	IC 18	.51	.47
	EC 28	.62	.57
	EC 64	.59	.59
	IC 66	.50	.46
	EC 68	.46	.40
	IC 70	.51	.49
	EC 72	.58	.55
	IC 74	.49	.47
	EC 76	.52	.49
	IC 78	.47	.48

Table 6.6
 Summary Scale Statistics for 21 Item Subscale B
 (alpha = .86)

Scale	Item	Item/factor score Correlation	Item-total Correlation
SSES	06	.35	.29
TA	11	.48	.43
TA	16	.42	.37
TA	17	.48	.49
ES	18	.50	.31
Dis	25	.53	.42
NESES	05	.52	.55
ES	09	.43	.47
ES	13	.60	.63
IS	23	.40	.48
IS	27	.46	.40
ES	33	.43	.44
ES	37	.37	.48
IS	43	.36	.37
ES	45	.50	.60
ES	49	.36	.39
IS	51	.39	.35
ES	53	.36	.42
ES	65	.39	.50
ES	69	.40	.45
ES	77	.46	.50

Table 6.7
Reliability: Internal Consistency of Original
Curiosity Scales and Subscales D and B

Scale	alpha
Subscale D	.87
Subscale B	.86
SSTA	.72
SSES	.61
SSDis	.67
SSBS	.44
NESES	.86
NESIC	.88
NESIS	.86
NESEC	.85
IM	.79
OTIMSC	.73 - .78
	.73 - .79
	.52 - .79
OTIMDC	.47
OTIMSD	.56
MCIT	.90

rescored to make their forms compatible. The rescoring reduced all of the items to a two point scale. The three categories on the IM were collapsed by grouping the "true, and typical of me" with "often or sometimes true" into one category. The MCIT four point scale was reduced to two categories by combining "almost never" and "sometimes", and grouping "often" with "almost always". Each 21 item subscale then had a score range from 21 to 42.

Characteristics of the new scale. The means and standard deviations for the two subscales are shown in Table 6.8 and the distribution of scores on each subscale is shown in Figure 6.2. Both scales had a negative skew.

Table 6.8
Means and Standard Deviations: Subscales D and B

Subscale	<u>M</u>	<u>SD</u>
D	33.34	5.24
B	35.18	4.86

Scores on subscales D and B were also analyzed to determine their relationship to the personal data variables of sex, age and intelligence. Table 6.9 presents the results of these analyses.

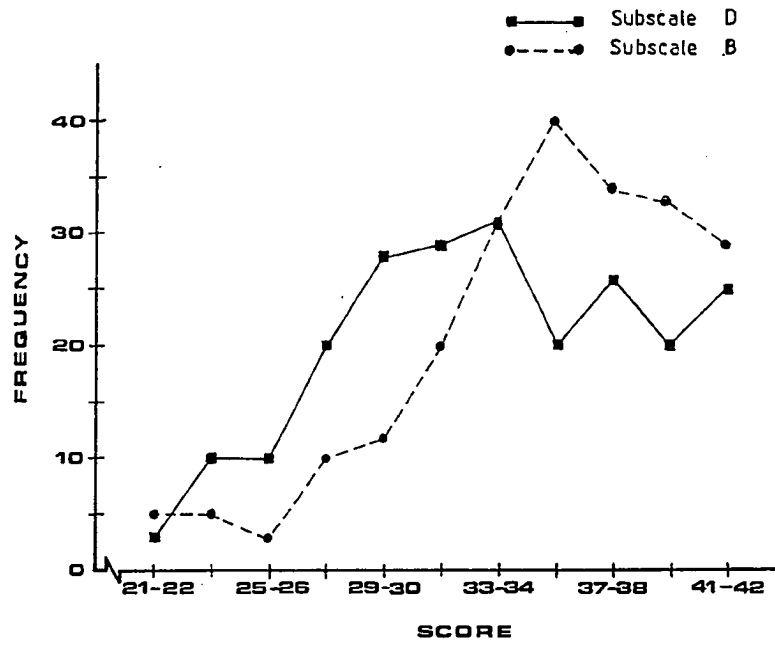


Figure 6.2 Frequency distribution: Scores on subscales D and B: Study 6.1 sample.

Table 6.9
Correlation Coefficients: Subscales D and B with
Group Characteristics of Sex, Age and IQ

	D	B
Sex	-.02	-.21*
Age	.27*	-.24*
AL-AQ	.10	.14

* $p < .05$

There was a low negative correlation between scores on subscale B and sex of the student, males scored slightly higher than females. There was also a low correlation between the students' age and scores on each of the subscales although the direction of these relationships was different. Age showed a low positive correlation with scores on subscale D and a low negative correlation with scores on subscale B. The correlations with AL-AQ were not significantly greater than zero.

Discussion

A 42 item scale was constructed consisting of two 21 item subscales (D and B). Subscale D contained items concerned with an interest in exploration and understanding of new objects, events and ideas, a depth of interest curiosity style. Subscale B contained items which were basically a seeking out of new experience and sensations, a breadth of interest curiosity style.

The subscales within this new scale were shown to have high levels of internal consistency. The distribution of scores on the subscales in both cases had a negative skew. A four point rating scale rather than a two point scale may be a more appropriate format for the items and would reduce the clustering at the top end of the distribution. This was the format used in a cross validation of the scale.

Study 6.3 Cross validation of the New Scale

Aim

To validate the structure of the new scale and its subscales through administration to a new group of students.

Method

The 42 items whose selection was reported in Study 6.2 were assembled into a new scale. The items were randomly assigned to positions 1 - 42 in a new scale format modelled along the lines of the MCIT. Each item was presented as a statement describing an activity or experience. A four-point response rating was required of "the extent to which you would like that type of activity or experience". In some cases minor changes in the wording of an item were made to suit this standard format. Item 04 from the IM scale, "Complicated machinery is fascinating to look at" became "Experiencing the fascination of a

piece of complicated machinery". The greatest change was required for items from the SSS which were in the form of pairs of statements. The positive statement of the pair was chosen and reworded to fit the standard form. For example, Item 25 from the SSS (SSTA) and its new form are shown below.

A. I am not interested in experience for its own sake.

B. I like to have new and exciting experiences and sensations even if they are a little frightening, unconventional or illegal.

Having new and exciting experiences and sensations even if they are a little frightening, unconventional or illegal.

Four response categories were provided and these were scored 1 - 4.

Do not like at all	1
Probably dislike	2
Probably like	3
Like very much	4

The subscale scores were calculated by summing the ratings marked for each set of items. The minimum score on each subscale was 21 and the maximum 84. (See Appendix G for a copy of the 42 item scale.)

The new scale was administered to a new group of teacher education students. A summary of the age and sex distributions for this group is presented in Table 6.10. The responses for this new group of students to the items on the new scale were then analysed to determine the nature of the scale's internal structure.

Table 6.10
Study 6.3 Group Characteristics: Age and Sex Distributions

Age (<u>Mdn</u> = 20 years)	Female	Male	Total
< <u>Mdn</u>	67	25	92
> <u>Mdn</u>	70	9	79
	137	34	171

Results

A factor analysis of the new 42 item scale was performed using the SPSS method of principal factoring with iteration (Nie et al., 1975). The correlation matrix and the table of principal factors from this analysis are presented in Appendix H. Eleven factors had eigen values greater than one and the first five of these accounted for 18.5, 16.4, 7.1, 4.2, and 3.6 percent of the variance respectively. Thereafter successive factors accounted for steadily diminishing proportions of the total variance. This pattern of results does not appear to indicate one general curiosity factor in these items. A scree plot (Cattell, 1966, 1978) suggested rotation of two or possibly three factors (see Figure 6.3). As a conservative check on the appropriateness of this decision, a rotation of four factors was also performed. In the rotated two factor solution shown in Table 6.11 all but two items had strong loadings on one or other of the factors and those loadings were consistent with the subscale membership of the

items. Subscale B items loaded on Factor 1 and subscale D items loaded on Factor 2.

Rotation of three factors (see Appendix H) produced a solution in which Factor 1 was the same as that for the two factor solution: subscale B items had strong loadings on Factor 1. Factors 2 and 3 were made up of subscale D items: 13 on Factor 2 and nine on Factor 3. Item 12 from subscale D had loadings on both Factors 2 and 3 ($F_2 = .51$, $F_3 = .33$). The four factor solution (see Appendix H) added a division within the subscale B items, eight of them loaded on Factor 4.

These results suggest that there were two main groupings within the items and that within those two groupings further subdivisions were possible. However, the further subdivisions were consistently within the two general classes and did not transect them.

As indicated earlier two items did not have one strong factor loading in the two factor solution. Item 22 had a loading on both factors ($F_1 = .34$, $F_2 = .48$), and Item 24 did not load clearly on either factor ($F_1 = .26$, $F_2 = .06$). These two items were deleted from the scale, one from each subscale. The final form of the scale then consisted of two 20 item subscales. A copy of the scale is presented in Appendix I.

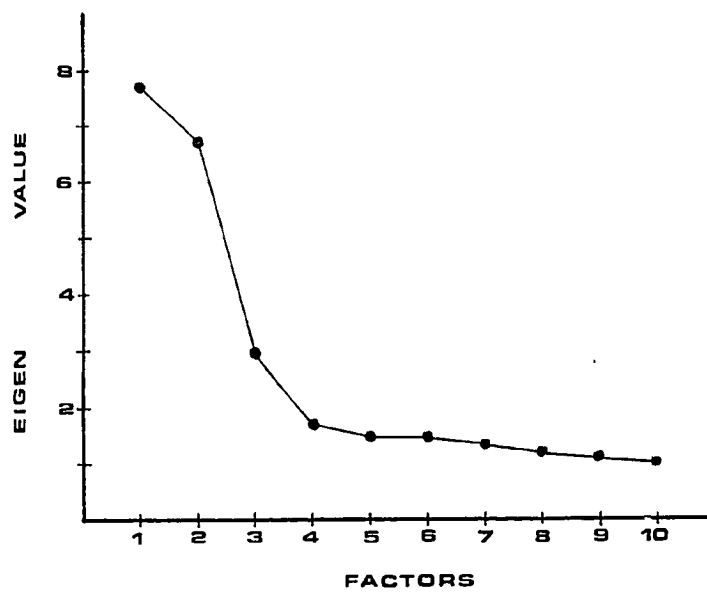


Figure 6.3 Scree plot of factors: 42 item scale.

Table 6.11
Varimax Rotation of Two Factors: 42 Item Scale^a

Item and Subscale		Rotated Factors ^b		Item and Subscale		Rotated Factors ^b	
		1	2			1	2
01	B	59	01	22	D	34	48
02	D	-17	51	23	B	37	04
03	B	60	20	24	B	26	-06
04	D	-15	54	25	B	57	-08
05	B	76	06	26	B	69	-13
06	D	-16	39	27	B	60	-05
07	D	-09	49	28	D	-01	35
08	D	-09	31	29	D	00	58
09	D	23	50	30	D	22	64
10	B	35	00	31	B	37	17
11	B	39	05	32	B	61	-07
12	D	-11	61	33	B	57	-07
13	D	-09	55	34	B	47	-04
14	B	74	-05	35	B	63	-00
15	D	09	50	36	B	63	-13
16	D	-10	70	37	B	78	-01
17	D	04	57	38	D	-11	50
18	B	45	07	39	D	23	70
19	B	48	09	40	B	58	10
20	D	16	48	41	D	02	55
21	D	-04	46	42	D	11	69

Note. Decimal points omitted.

^aThese two factors accounted for 34.9% of the total variance.

^bValues >.29 have been entered in **bold type**.

A two factor curiosity scale. A factor analysis was performed on the scores for the 40 item form of the scale and the results showed a marginal increase in the percentage of variance accounted for by the first two factors (F1 = 19.0 percent, and F2 = 16.6 percent of the total variance). A table of the loadings for rotated Factors 1 and 2 is presented in Appendix J.

The two subscales (D and B) were then factored separately. For subscale D there were five factors with eigen values greater than 1.0 accounting for 32.2, 12.3, 6.7, 5.5, and 5.0 percent of the total variance, respectively. Separate rotations of two, three, four and five factors (see Appendix K) suggested that there were two main groupings of items within this subscale. One group consisted of items concerned with exploration and seeking to understand ideas, theories and puzzling phenomena, e.g., Item 02: "Thinking of different ways to explain the same thing". The other group was made up of items such as Item 15 "Thinking about the mathematical procedures possible with new calculating machines", items concerned with exploration and investigation of complex mechanical phenomena.

The three-factor rotation produced a third group of items which consisted of seven items, four of which also had loadings on Factor 2. Factor 4 in the four-factor solution was made up of two items, and in the five-factor solution Factors 4 and 5 each had only three items with loadings greater than .29.

For subscale B there were four factors with eigen values greater than 1.0 and they accounted for 36.5, 8.6, 6.2, and 5.6 percent of the

total variance, respectively. Rotations of two, three, and four factors appear in Appendix K. In the two-factor solution 13 items loaded on Factor 1 and 15 on Factor 2: eight items loaded on both factors. A similar pattern was observed in the three-factor solution. Of the 13 items which loaded on Factor 1 and the 13 which loaded on Factor 2, seven had loadings on both factors. Five items loaded on Factor 3 and, of these, four also had loadings on Factor 1. The pattern of loadings in the four-factor solution also indicated a considerable degree of overlap between the large set of items on Factor 1 and the smaller groupings which made up later factors. These results suggested that there was one main group factor in this scale together with smaller more specific item groupings.

Scale characteristics: subscales D and B. The two subscales had a possible score range of 20 - 80. The distribution of scores for each of these subscales presented in a frequency distribution in Figure 6.4, indicates that the scores are distributed over the full range for both scales.

A Kolmogorov-Smirnov goodness of fit test was applied to the sets of scores for each subscale (Hull & Nie, 1979). This procedure tests whether the distribution of scores on each subscale could reasonably have come from a specified theoretical distribution, here a normal distribution. The Kolmogorov-Smirnov z scores and associated p values are presented along with other summary statistics in Table 6.12 and suggest that the distributions for both subscales are not significantly different from a normal distribution.

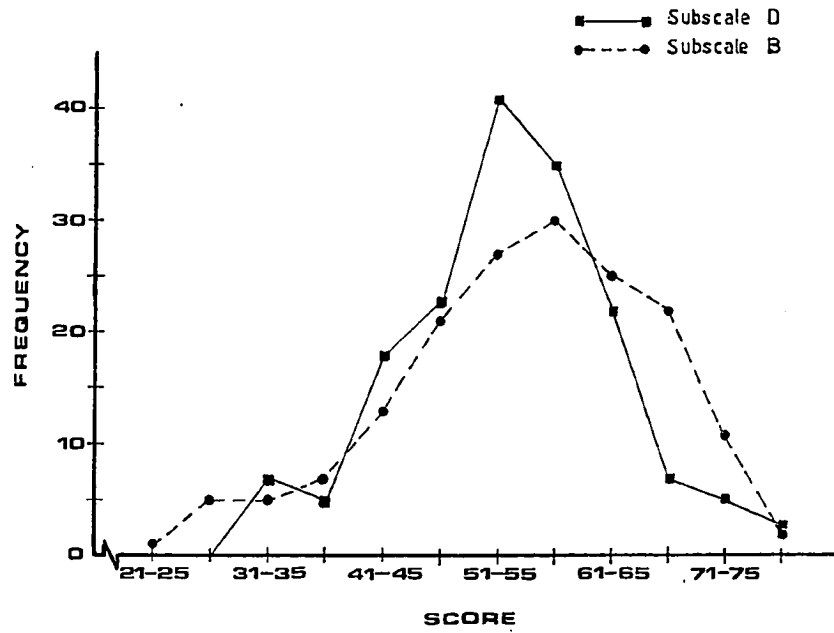


Figure 6.4 Frequency distribution: Scores on 20 item subscales D and B.

The basic scale characteristics for the two subscales of the two factor curiosity scale as they appeared with this group are summarized in Table 6.12. The alpha coefficients indicated that both subscales had a high degree of internal consistency. In addition, all item-total correlations for both subscales were greater than .30 and more than 50 percent were greater than .50 (see Appendix L).

Table 6.12
Scale Characteristics: Subscales D and B^a (N = 171)

	D	B
Mdn	53.64	56.75
\bar{M}	54.04	55.61
\bar{SD}	9.26	11.61
alpha	.89	.91
Kolmogorov-Smirnov:		
$\frac{z}{p}$.86 .46	.92 .37

$${}^a r_{D/B} = -.01$$

Correlation coefficients were computed between the scores on the two subscales and the variables of sex and age. As can be seen from Table 6.13, the size of the correlation coefficients between the scores on these subscales and the variables of sex and age was generally consistent with the pattern found in the responses of the group used for the construction of the scale. The only noticeable difference was a stronger negative correlation between age and scores on subscale B. Figure 6.5 graphs the cumulative percentage distributions of age for both groups and indicates that the group used

in the cross-validation study, although having the same range and median age, had a larger percentage of the group spread across the older age levels. This difference between correlations according to the age distribution of the group is consistent with Zuckerman's (1975) report of a negative correlation between age and the subscales of the SSS, especially the SSES and SSTA which are closely related to subscale B.

Table 6.13
Correlation Coefficients: Subscales D and B
with Age and Sex of Cross-validation Group^a

Variable	D	B
Sex	-.05 (.02)	-.29* (-.21)
Age	.16 (.27)	-.53* (-.24)

^aCorrelation coefficients found in Study 6.2 are in parentheses.

* $p < .001$.

Test-retest reliability data were not collected as part of this crossvalidation study. The scale was however administered twice to a group of teacher education students which consisted of 23 females and 24 males with a median age of 21 years. The scale was administered and then readministered seven days later. The test-retest reliability results are presented in Table 6.14.

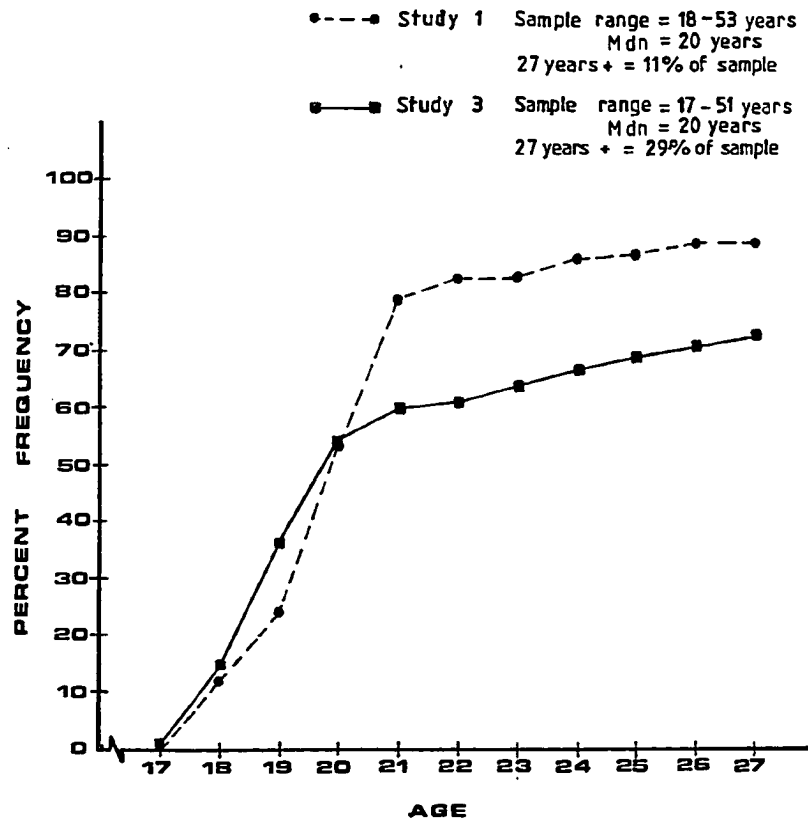


Figure 6.5 Cumulative percentage distribution of age:
Study 6.1 and study 6.3 groups.

Table 6.14
 Seven Day Test-Retest Reliability of Subscales D and B
 (N = 47)

Subscale	$r_{\text{test/retest}}$
D	.90
B	.93

As part of the same study, measures of trait anxiety (STAI A-Trait Scale, Spielberger et al., 1970) and general verbal ability (ACER Advanced Test AL, 1955) were also recorded. The correlations between these variables and the scores on the D and B subscales are presented in Table 6.15 and indicated that for this group, as for the group reported in Study 6.2, there was a zero correlation between a test of general verbal ability and scores on the curiosity subscales. The correlations with anxiety were not significantly greater than zero but were in a direction consistent with the general finding of a low negative correlation between measures of anxiety and curiosity (Boyle, Note 2; Devlin, Note 3; Dickie, Note 4).

Table 6.15
Correlation Coefficients: Subscales D and B
with Trait Anxiety and Verbal Ability

Variable	D	B	<u>N</u>
A-Trait	-.21	-.19	60
ACER-AL	.06	.07	47

* $p < .05$

Summary

The 42 item scale with its depth (D) and breadth (B) of interest curiosity subscales was administered to a new sample of tertiary college students and characteristics of the scale analyzed. Two items were deleted after the first factor analysis because they did not conform to the clear factor pattern inherent in the majority of the items. The psychometric properties of the remaining 40 items have been detailed. These properties suggest that the two subscales, depth of interest curiosity (D) and breadth of interest curiosity (B) function as separate scales each with a high degree of internal consistency.

Discussion

Langevin's (1976) critique of curiosity scales argued that both

the internal structure and the discriminant validity of existing curiosity scales could only be judged as poor. The studies in this chapter have reported the development of a curiosity scale which measures the two different dimensions which analysis of the research literature suggests make up the construct curiosity. In addition, this scale has been constructed to conform with the criteria of a sound test both in terms of its internal psychometric properties and its ability to distinguish what is curiosity from other important psychological constructs.

Psychometric Properties of the New Scale

Earlier in this chapter Langevin's (1976) criteria for a sound test were quoted.

Sound tests should have, to some degree, the following properties: normal distributions, no floor or ceiling effects, substantial item-test (part-remainder) correlations, high alpha reliability (KR 20 >.60; Nunnally, 1967) and a large single test factor.
(Langevin, 1976, p. 256)

The properties of the Two Factor Curiosity scale will be examined against these criteria.

Normal distributions. In the crossvalidation study (Study 6.3), both subscales were shown on a Kolmogorov-Smirnov goodness of fit test (Hull & Nie, 1979) to have score distributions which were not significantly different from normal distributions.

Floor-ceiling effects. Appendix M presents a summary of the response distributions for all the 40 items of the two factor curiosity scale. There were very few items which did not have a reasonable spread of responses over all four response categories. If the responses to this scale were collapsed to a two category system nine items would have fewer than 20 percent of responses in the combined 1/2 category. No items would have fewer than 20 percent of responses in the 3/4 grouping. The items in the scales analyzed by Langevin (1976) were all of a form having only two response categories. A four category response system would seem to be a more satisfactory item form.

Part-remainder coefficients. Langevin (1976) reported that "many of the curiosity tests show over 50% of the test items to have part-remainder correlations which are between $r = 0$ and $.20$ " (p. 256). As indicated earlier (see Appendix L) all item-total correlations for the items on the depth and breadth subscales were greater than $.3$ and more than 50 percent were greater than $.5$.

Alpha reliabilities. Following Nunnally (1967), Langevin (1976) recommended $.60$ as a minimum acceptable alpha value. The depth and breadth subscales had alpha coefficients of $.89$ and $.91$ respectively.

Principal components. "The results showed that in no case did the largest eigen value account for more than 20% of the variance." (Langevin, 1976, p. 256). Analysis of the breadth and depth subscales yielded factor structures with the largest factor accounting for 36.5 percent and 32.2 percent of the variance respectively.

On each of these criteria the depth and breadth subscales of the two factor curiosity scale appear to have acceptable psychometric credentials. They function as separate internally consistent scales.

Discriminant Validity

Another important issue raised by Langevin (1976) with respect to the validity of curiosity scales was that of their discriminant validity, and he specifically mentioned their relationship to the variables of social desirability, intelligence and anxiety. A social desirability scale is contained within the items of the OTIM and so it was possible to examine the relationship between the curiosity scale scores and social desirability (OTIMSD) using the Study 6.1 data. The AL (verbal) form of the ACER - Advanced Tests AL-AQ (ACER, 1955) and the A-Trait scale of the STAI (Spielberger et al., 1970) were administered to a group of teacher education students (see Table 6.15), providing another set of data pertinent to the issue of the discriminant validity of the depth and breadth subscales.

Social desirability. Langevin (1976) reported correlations between the curiosity scales¹ used in that study and the OTIM social desirability scale, in the range of -.23 to .57. He commented that "for most scales, the Soc. Des. correlations represent some of their

¹ Scales used were: Berlyne Figures (Day, 1964), Barron Welsh Art Scale (Welsh, 1959), Interest in Complex Paintings Test (Langevin, 1976), Stimulus Variation Seeking Scale (Penney & Reinehr, 1966), Sensation Seeking Scale (Zuckerman, 1971), OTIM (Day, 1971).

highest." (Langevin, 1976, p. 258) The correlations between the social desirability subscale of the OTIM (OTIMSD) and the original tests used for Study 6.1 are presented in Appendix N. Those scales which were selected to be measuring a breadth of interest curiosity style generally had zero correlations with the OTIMSD scale. Those selected to be measuring a depth of interest curiosity style had low positive correlations (.11 to .25). The small positive correlation between social desirability and the depth of interest type scales manifested itself in the small loading of the OTIMSD subscale on Factor 1 when all the scale scores were factored. The depth and breadth subscales which were constructed (Study 6.2) maintained this pattern of relationship. The depth subscale had a correlation of .29 with OTIMSD. For the breadth subscale the correlation was zero. These findings suggest that there is a small but significant overlap between a social desirability response set as measured by the OTIMSD and the depth subscale of the two factor curiosity scale.

The correlations found in the present study are lower than those found by Langevin (1976) and this inconsistency between findings may well be a function of sample differences. The group from whom Langevin's curiosity scores were collected consisted of a group of 31 hospitalized schizophrenic patients and a group of 19 college students. The curiosity scores were collected as a part of a larger study which was concerned with the consistency of judges' ratings of schizophrenics and non-schizophrenics (Langevin & Hutchins, 1973). The sample for the present study was much larger and in all probability more homogeneous.

Intelligence.

On the basis of existing evidence it cannot be ruled out that curiosity measures are significantly confounded by IQ scores.

(Langevin, 1976, p. 253)

A large number of studies has included in their design some assessment of the relationship between curiosity and general ability (e.g., Coie, 1974; Day & Langevin, 1969; Naylor, 1981; Penney & McCann, 1964; Vidler & Rawan, 1974; Zuckerman, 1975). The findings of these studies which have employed a wide range of different tests for measuring both curiosity and intelligence have consistently yielded a low positive correlation between the two variables. The correlations in Langevin's (1976) study are a little higher (VIQ .30 to .37, PIQ .23 to .42) than those generally found in other studies.

In the present study the correlation between intelligence and curiosity was close to zero. This was consistent across the original scales and the two new subscales constructed. (See Appendix D for correlations between ACER AL-AQ and original scales.)

Anxiety. Following Day's (1968b) argument that curiosity would have zero to moderate negative correlations with anxiety, Langevin (1976) proposed that anxiety measures offer an index of discriminant validity for curiosity measures. As was reported earlier (Table 6.15) low negative correlations were found between the depth and breadth subscales and trait anxiety (STAI, A-Trait, Spielberger et al., 1970).

General Conclusion

The studies reported in this chapter were designed to test the general proposition that curiosity can be represented as a construct embracing two separate styles of behaviour: breadth of interest and depth of interest curiosity. This was done through an empirical analysis of the structure of existing measurement scales and the development of a new scale which incorporates both breadth of interest and depth of interest dimensions.

Three studies were reported. In the first study a selection of scales which have been used in the assessment of curiosity in adults was administered to a group of teacher education students. Factor analysis of the scores from these scales indicated a two factor solution consistent with the breadth of interest and depth of interest curiosity formulation. The second study reported the development of a new scale designed to measure each of the two factors. This scale was developed by assembling together items from the original scales which correlated most strongly with the breadth and depth factors. The final study reported the results of a cross-validation in which the new two factor scale was administered to a new group of college students. The scores were again factored and the results confirmed the predicted two factor structure of this scale. The resulting 40 item scale: the Two Factor Curiosity Scale, was also shown to have sound psychometric properties.

CHAPTER 7

THE VALIDITY OF THE TWO FACTOR CURIOSITY SCALE

Overview: In Chapter Six the construction and development of the Two Factor Curiosity Scale was outlined. The scale was constructed to measure the two dimensions: breadth of interest curiosity and depth of interest curiosity. The first form of the scale was then administered to a second group of teacher education students and its internal structure analysed. On the basis of these results, the conclusion was drawn that the subscales of the Two Factor Curiosity Scale were measuring separate dimensions, and that the scale had sound psychometric properties.

The present chapter extends that analysis of the internal structure of the Two Factor Curiosity Scale through an examination of the responses of a group of Year 10 students. The latter were younger than the groups of students used in the scale's development and represented a broader range of ability. Similar analyses to those reported in Chapter Six were performed. The results from these analyses indicated the same basic internal structure for the Two Factor Curiosity Scale as was evident in the responses of the groups who participated in the scale's construction. On the basis of these results the conclusion is drawn that the Two Factor Curiosity Scale is a sound test measuring two separate curiosity dimensions: breadth of interest curiosity and depth of interest curiosity.

This chapter details the findings of a further investigation of the validity of the structure of the Two Factor Curiosity Scale, the rationale and development of which was reported in Chapter Six. The findings of the cross-validation study reported in Chapter Six are limited in their generality by truncation of the range of general ability represented in that test group. In addition, all of the test group were undertaking the same form of tertiary studies: teacher education. The present chapter reports an investigation which confirms these findings through an examination of the responses of a larger

sample and one more heterogenous in abilities and interests. Attention is focussed on the number and nature of the factors which best account for the relationships between item responses. Sex differences in the patterns of responses are examined. The relationship between scores on the two subscales (breadth and depth of interest) of the Two Factor Curiosity Scale and scores on a measure of general ability are also considered.

The Two Factor Curiosity Scale was administered to all year 10 students attending seven non-government secondary schools in metropolitan Melbourne. These students were all of similar age and were younger than those who participated in the first cross-validation study. Because the test group included all Year 10 students from the participating schools it can be assumed that this group represents a broader range of abilities and interests than either of the groups who were respondents for the scale construction and cross-validation studies reported in Chapter Six. The groups in the studies reported in Chapter Six had a preponderance of females (80% females, 20% males). The new group although having a slightly larger number of males than females, was much closer to an even proportion of the sex groups (42% females, 58% males).

The results and analyses reported in this chapter provide a further test of the validity of the Two Factor Curiosity Scale and thereby provide additional evidence with which to assess the basic proposition of this thesis: i.e., that curiosity can best be understood as a construct subsuming two different styles of behaviour: breadth of interest curiosity and depth of interest curiosity.

Method

The Two Factor Curiosity Scale was administered to 609 Year 10 secondary students from seven non-government schools. In the same session the School and College Ability Test (SCAT Series 11, 1973), a test of general ability was also administered. Table 7.1 presents a summary of the age and sex distributions for this group and indicates that there was no significant association between the distribution of these two variables.

Table 7.1
Sample Characteristics: Age and Sex Distributions^a

Age (<u>Mdn</u> = 15 years)	Female	Male	Total
< <u>Mdn</u>	122	187	309
> <u>Mdn</u>	135	164	299
	257	351	608 ^b

^aChi-square = 1.65, 1 d.f., NS.

^bAge data for one case missing.

Responses to the 40 items of the Two Factor Curiosity Scale were then analysed using factor analytic techniques to determine the nature of its internal structure.

Results and Discussion

Factor Structure of the Two Factor Curiosity Scale

The item responses were subjected to a factor analysis using the SPSS method of principal factoring with iteration (Nie et al., 1975). The correlation matrix and table of principal factors for this analysis are presented in Appendix O. All of the factors with eigen values greater than one are represented in the scree plot (Cattell, 1966; 1978) shown in Figure 7.1.

As was the case with the results presented in Chapter Six, the amount of variance accounted for by each factor clearly suggests that more than one factor is needed to interpret the variation in item responses. Of the factors shown in Figure 7.1, the first five accounted for 19.1, 13.1, 7.1, 4.7, and 3.2 percent of the total variance respectively. Further factors added only minimal increments to the percentage of total variance explained. Inspection of the scree plot suggested rotation of two or possibly three factors. As with the earlier analyses reported in Chapter Six, a check on this decision was made by applying Kaiser's rule (Rummel, 1970) which required separate rotation of two, three, four, and five factors. The resulting patterns of factor loadings were all examined.

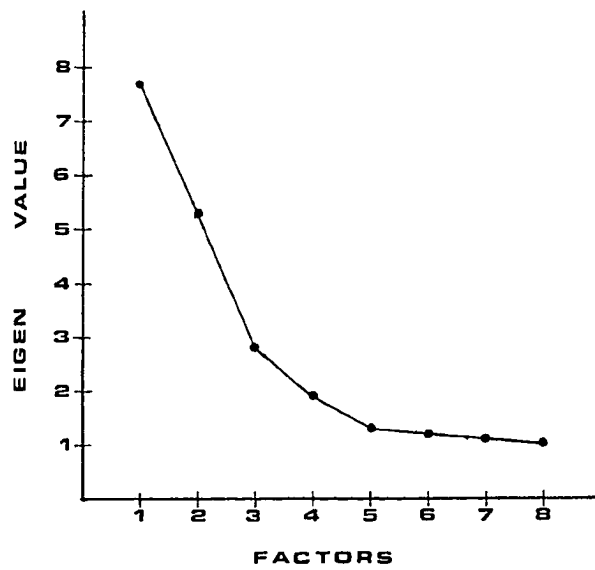


Figure 7.1 Scree plot of factors: The Two Factor Curiosity Scale

Table 7.2
 Varimax Rotation of Two Factors^a: 40 Item Scale (N = 609)

Item and Subscale	Rotated Factor ^b		Item and Subscale	Rotated Factor ^b	
	1	2		1	2
01 B	55	19	21 D	12	46
02 D	-01	40	22 B	29	21
03 B	52	-01	23 B	60	01
04 D	01	56	24 B	65	-02
05 B	71	06	25 B	51	24
06 D	00	51	26 D	12	39
07 D	01	60	27 D	-04	70
08 D	-01	36	28 D	14	55
09 D	21	41	29 B	36	19
10 B	44	01	30 B	52	01
11 B	37	-05	31 B	47	10
12 D	-03	67	32 B	60	04
13 D	-06	59	33 B	59	12
14 B	62	08	34 B	53	-10
15 D	-08	51	35 B	68	07
16 D	-04	50	36 D	06	55
17 D	08	57	37 D	16	55
18 B	47	06	38 B	51	12
19 B	39	02	39 D	16	43
20 D	22	46	40 D	16	54

Note. Decimal points omitted.

^aThese two factors accounted for 32.3% of the total variance.

^bValues >.29 have been entered in **bold** type.

The results from the rotation of two factors are presented in Table 7.2. Inspection of Table 7.2 indicates that for all but one item (Item 22) there was a strong loading on one of the factors and a very small loading on the other factor. In all cases the strong loading was on the factor consistent with the items subscale membership: the breadth subscale items loaded on Factor 1 and the depth subscale items loaded on Factor 2. Item 22 did not have a strong loading on either factor ($F1 = .28$, $F2 = .21$).

Factor loadings for the 40 items when three, four and five-factor rotations were performed are presented in Appendix O.

Examination of the pattern of loadings resulting from the three-factor rotation indicated that all 20 of the breadth subscale items loaded on Factor 1 (i.e., had loadings greater than .29). Factors 2 and 3 were made up of separate groupings of the depth subscale items. Factor 2 had 14 items with loadings greater than .29 and Factor 3 had 7 items with loadings of greater than .29. Only one of the depth subscale items loaded on both factors: Item 15 ($F2 = .30$, $F3 = .45$). Item 22 which did not load clearly on any factor in the two-factor solution had a loading of .31 on both Factor 1 and Factor 2 in the three-factor solution. As in the two-factor solution, this was the only item which did not conform to the predicted pattern of separation between the breadth subscale and the depth subscale items.

The division within the depth subscale items which this three-factor solution produced can be characterized as one between items concerned with the exploration and analysis of ideas, and items concerned with seeking to explore mechanical problems and phenomena. A

consideration of the content of the items with the highest loadings on Factors 2 and 3 points to this interpretation. Item 27 ("Searching for answers") had a loading of .67 on Factor 2, and Item 04 ("Figuring out why some event happened the way it did") a loading of .64. The highest loadings on Factor 3 were on Items 40 and 28 ("Experiencing the fascination of a piece of complicated machinery" .80, and "Figuring out how a light meter works" .71 respectively).

Rotation of four factors again conformed with the breadth and depth groupings. The fourth factor consisted of a separation within the breadth subscale items: 15 had loadings of greater than .29 on Factor 1 while 7 items had loadings of greater than .29 on Factor 4. Two items had loadings on both Factors 1 and 4 (Item 23 $F_1 = .44$, $F_4 = .44$; Item 38 $F_1 = .33$, $F_4 = .48$). Only one item did not conform to this general pattern separating the breadth and depth items and that was Item 20, a depth subscale item which in the four-factor solution had a loading of .49 on Factor 2 and .33 on Factor 4.

Factors 1 and 4 of this four-factor solution consisted of a separation between items whose content is predominantly couched in terms of "thrilling" activities and items where a "risk/fear" element is emphasized. The highest loading of the 15 items appearing on Factor 1 in this solution was a loading of .67 for Item 35 ("Being on a raft in the middle of the Colorado River"). Item 18 ("Walking into an old deserted house at midnight") with a loading of .73, was the item with the highest loading on Factor 4.

The pattern of loadings for the items which resulted when five factors were rotated indicated that further factors would consist of

specific items and pairs of items. Factor 5 had only two items with loadings greater than .29, Items 07 and 08, two items from the depth subscale with loadings of .38 and .34 respectively. The first four factors were substantially the same as those resulting from the four-factor rotation.

Consideration of these patterns of loadings suggests that all of the items of the Two Factor Curiosity Scale (with the exception of Item 22) can be separated clearly into two main groupings matching their subscale designation. Each of these two main factors can be subdivided further: a rotation of four factors divided the breadth subscale items onto Factor 1 and 4, and the depth subscale items onto Factors 2 and 3. However, this was not without some degree of overlap. One depth subscale item loaded on both Factors 2 and 3, and two of the breadth subscale items loaded on both Factors 1 and 4. Division beyond four factors fragmented the items into very small groupings consisting primarily of the variance associated with item pairs and individual items. These results support the general conclusion that the item responses represent two different curiosity styles.

Analysis by Sex Groupings

Similar analyses were performed for responses of the female and male groups separately. The correlation matrices and corresponding tables of principal factors are presented in Appendices P and Q.

Females. The results of the principal factoring for the female respondents indicated 11 factors with eigen values greater than one, accounting for 18.5, 12.2, 6.9, 4.6, 3.6, 3.4, 3.0, 2.8, 2.7, 2.6, and

2.5 percent of the total variance respectively. Using the same criteria as outlined previously, rotation of two factors seemed the most appropriate solution. Again, as a check, rotations of two, three, and four factors were performed. The factor loadings of each item for the two-factor solution are presented in Table 7.3.

Inspection of Table 7.3 indicates that all 40 items had a strong loading on the factor matching their subscale membership: the breadth subscale items had strong loadings on Factor 1 and the depth subscale items strong loadings on Factor 2.

The pattern of loadings for the female respondents when three factors were rotated (see Appendix P) was generally consistent with those obtained when the total set of responses was entered into the analysis. All of the the breadth subscale items only had loadings greater than .29 on Factor 1 except Item 22 which had a small loading on both Factors 1 and 2 ($F1 = .38$, $F2 = .32$, and $F3 = -.10$). The depth subscale items, with the exception of item 26 ($F1 = .28$, $F2 = .29$, and $F3 = .21$), all loaded on Factors 2 and 3. In this three-factor solution there was more overlap between Factors 2 and 3 than was the case with the total set of item responses. Four items loaded on both Factors 2 and 3: Items 07, 12, 17 and 27, however, in each case one of the loadings was appreciably larger than the other.

Rotation of four factors (see Appendix P) produced a solution which divided the breadth subscale items into two factors. Fourteen of the 20 items had loadings on Factor 1 and six items had loadings on Factor 4. One item had a loading greater than .29 on both factors (Item 23: $F1 = .44$, and $F2 = .37$) and one of the breadth subscale

Table 7.3
 Varimax Rotation of Two Factors^a: 40 Item Scale - Females
 (n = 258)

Item and Subscale	Rotated Factor ^b		Item and Subscale	Rotated Factor ^b	
	1	2		1	2
01 B	48	15	21 D	29	40
02 D	03	37	22 B	40	16
03 B	50	00	23 B	57	-04
04 D	14	57	24 B	61	-01
05 B	67	10	25 B	50	29
06 D	00	49	26 D	29	35
07 D	01	59	27 D	06	68
08 D	03	37	28 D	05	52
09 D	10	46	29 B	41	20
10 B	36	-02	30 B	43	08
11 B	41	-05	31 B	37	08
12 D	-02	64	32 B	58	09
13 D	-08	61	33 B	56	15
14 B	54	04	34 B	55	-08
15 D	-06	48	35 B	65	08
16 D	10	49	36 D	12	49
17 D	-06	55	37 D	06	58
18 B	46	00	38 B	48	09
19 B	43	-06	39 D	12	40
20 D	28	42	40 D	02	55

Note. Decimal points omitted.

^aThese two factors accounted for 30.7% of the total variance.

^bValues >.29 have been entered in bold type.

items did not load on any of the four factors (Item 31: $F_1 = .27$, $F_2 = .05$, $F_3 = .07$, and $F_4 = .26$). As in the three-factor solution the depth subscale items were spread over Factors 2 and 3, again with some overlap. Three of the depth subscale items also had small loadings on one of the factors marked by the breadth subscale items (Item 20: $F_2 = .50$, $F_4 = .35$; Item 21: $F_2 = .56$, $F_4 = .32$; and Item 26: $F_1 = .30$, $F_2 = .33$).

The pattern of results which emerged from analysis of the female item responses was highly consistent with that of the total group. There were two main groupings in the items matching the breadth and depth subscales. The breadth subscale items could be further divided into

"thrilling" and "frightening" items, and the depth subscale items into "exploration of ideas" and "exploration of mechanical phenomena" groupings. The strongest point of difference between the pattern which emerged from the female item responses and that for the total group was the weaker separation of the two sets of items within the depth subscale.

Males. The item responses for the male respondents were subjected to a similar analysis and were shown to have 8 factors with eigen values greater than one, accounting for 18.8, 14.7, 6.2, 4.8, 3.5, 3.2, 2.9, and 2.6 percent of the total variance respectively (Appendix Q presents the correlation matrix and table of principal factors for this analysis). Inspection of the table of unrotated factors indicates that the first two factors each accounted for a considerably larger percentage of the total variance than did any other factor (18.8 and 14.7 percent of the total variance respectively). Table 7.4 presents

the factor loadings for each of the items when two factors were rotated. As a further check on the appropriateness of the decision to rotate two factors, three and four-factor rotations were also performed and the resultant factor loadings for each of the items are presented in Appendix Q.

As with the pattern of item responses for the female respondents Table 7.4 demonstrates clearly that the items achieved relatively strong loadings on one factor and small or negligible loadings on the other factor. There was only one item that did not conform with this general tendency and that was Item 22 which had small loadings on both factors ($F1 = .26$, $F2 = .27$). The only difference between the general form of the two-factor solutions for the females and the males was the order of the two factors. The two-factor solution for the females listed the breadth subscale items on Factor 1; the two-factor solution for the males listed the breadth subscale items on Factor 2.

Appendix Q presents the factor loadings for the male responses to the items when three factors were rotated. All of the the breadth subscale items had loadings greater than .29 on Factor 1 except Item 22 which had similar small loadings on both Factors 1 and 2 ($F1 = .27$, $F2 = .30$, and $F3 = .02$). The depth subscale items loaded on Factors 2 and 3 with only two items (Items 15 and 17) loading on both factors. As with the earlier analyses the difference between those items loading on Factor 2 and those loading on Factor 3 was a difference between items concerned with the exploration of ideas, and items concerned with exploration of complex and puzzling mechanical phenomena.

Table 7.4
 Varimax Rotation of Two Factors^a: 40 Item Scale - Males
 (n = 351)

Item and Subscale	Rotated Factor ^b		Item and Subscale	Rotated Factor ^b	
	1	2		1	2
01 B	19	53	21 D	51	09
02 D	42	05	22 B	26	27
03 B	00	58	23 B	02	58
04 D	56	-01	24 B	-05	66
05 B	-01	69	25 B	18	44
06 D	55	10	26 D	42	06
07 D	62	05	27 D	70	-09
08 D	39	05	28 D	58	06
09 D	39	14	29 B	18	32
10 B	02	55	30 B	-08	50
11 B	-05	41	31 B	11	56
12 D	68	-01	32 B	01	62
13 D	59	03	33 B	09	60
14 B	08	66	34 B	-12	54
15 D	52	-20	35 B	04	67
16 D	54	-04	36 D	59	08
17 D	60	00	37 D	57	06
18 B	08	43	38 B	13	54
19 B	05	36	39 D	46	08
20 D	47	20	40 D	58	04

Note. Decimal points omitted.

^aThese two factors accounted for 33.6% of the total variance.

^bValues >.29 have been entered in **bold type**.

Addition of a fourth factor in the solution increased the variance accounted for by 4.8 percent. This small increase in the percentage of total variance was achieved at the sacrifice of considerable clarity in the form of the solution. The breadth subscale items divided onto Factors 1 and 4. Factor 1 had 16 items with loadings greater than .29 while Factor 4 had 7. These sets numbered four in common: Items 10, 11, 23 and 38. A further item (Item 29) did not load on any of the four factors ($F_1 = .22$, $F_2 = .09$, $F_3 = .17$, and $F_4 = .27$). A similar degree of overlap was observed in the division of the depth subscale items onto Factors 2 and 3. Three items (Items 08, 15, and 17) had loadings greater than .29 on both factors. All of the depth subscale items loaded on one or both of Factors 2 and 3.

Summary. The pattern of results yielded by the different analyses were highly consistent. Only one item did not conform to the predicted breadth and depth groupings and that was Item 22 ("Having a vivid dream with strange colours and sounds"). It would seem likely that the wording of this item allowed for two different interpretations. Its content could be taken to refer to experiencing those sensations described, or, alternatively, to refer to thinking about those sensations in the sense of analysing them. This difference is precisely the difference which is crucial to the distinction being drawn between the breadth and depth of interest curiosity styles. The observed difficulty with Item 22 appears to be a feature of the responses of the males in the group. In the two-factor solution for the females Item 22 had a loading of .40 on Factor 1 and .16 on Factor 2, while for the males the corresponding loadings were .26 and .27 respectively.

For the total set of responses the three-factor rotation produced a pattern of factor loadings which amounted to a split within the depth subscale items. This split can be characterised as one between items concerned with the exploration and analysis of ideas, and items concerned with seeking to explore complex mechanical problems and phenomena. The validity of this interpretation can be illustrated by a consideration of the content of those items with the highest loadings on each of Factors 2 and 3. Item 27 ("Searching for answers") had a loading of .67, and Item 04 ("Figuring out why some event happened the way it did") a loading of .64 on Factor 2. These two items were among those with the highest loadings for both the female and male analyses (females: Item 04 = .63, Item 27 = .60; males: Item 27 = .72, Item 04 = .63). The highest loadings on Factor 3 were on Items 40 and 28 ("Experiencing the fascination of a piece of complicated machinery" .80, and "Figuring out how a light meter works" .71 respectively).

The separate analyses for the two sex groups yielded results which were consistent with those found when the total group's responses were analysed. Items 40 and 28 figured prominently among those items with the highest loadings on Factor 3 for both the sex groups (females: Item 40 = .71, Item 28 = .65; males: Item 40 = .78, Item 28 = .66).

A rotation of four factors produced a division within the breadth subscale items. This split appears to represent a separation between items whose content is predominantly couched in terms of "thrilling" activities and items where a "risk/fear" element is emphasized. The highest loading of the 15 items appearing on Factor 1 in this solution was Item 35 ("Being on a raft in the middle of the Colorado River")

with a loading of .67. The same substantive interpretation holds for the results of the female and male groups factored separately. For both groups the highest loading on Factor 1 was Item 05 ("Riding the rapids in a swift moving stream" - females: .68, males: .73); a similar item and also one accurately characterized as representing a "thrilling" activity. The item with the highest loading on Factor 4 was Item 18 ("Walking into an old deserted house at midnight"). This was true for all three analyses; the total group and for the female and male groups factored separately (total group: .73, females: .78, and males: .70).

Analysis of the patterns of loadings over the various solutions for each of the male and female subgroups, as well as those found in the analysis of the total set of responses, suggests that the most appropriate factor solution for these data is a two-factor solution. This solution separated the 40 items of the Two Factor Curiosity Scale into two sets which did not overlap. Rotation of additional factors gave a marginal increase in the percentage of total variance accounted for, but produced factors which were not as clearly separated. There was some evidence that the two main factors could each be subdivided further. The particular sets of items produced by these further subdivisions were consistent over the three analyses. The exact lines of division and the degree of overlap between these additional factors showed some slight differences according to whether the total group, male, or female responses was being considered.

Two Curiosity Styles

The two sets of 20 items were then factored separately. Appendix

R presents the correlation matrices and tables of principal factors for each of these analyses.

When the items in the depth subscale were factored separately the principal factors solution indicated three factors with eigen values greater than one. These accounted for 31.1, 12.9, and 6.0 percent of the total variance respectively. The reasonably high percentage of the variance accounted for by the first factor suggested that there was a general factor underlying the responses to the depth subscale items. Rotations of two and three factors were performed and the results are presented in Appendix R.

The rotated solutions suggested that there were two main groupings of items within this scale. One group included items like "Searching for answers" (Item 27) and "Figuring out why some event happened the way it did" (Item 04) which are all concerned with the exploration of ideas. The second group of items are concerned with the investigation of puzzling mechanical phenomena, and included such items as "Experiencing the fascination of a piece of complicated machinery" (Item 40), and, "Figuring out how a light meter works" (Item 28). The third factor in the three-factor rotation was made up of a small group of five items and had considerable overlap with the first two factors.

The percentage of the variance accounted for by the first principal factor suggested that there is a general factor linking all of the depth subscale items: depth of interest curiosity. All of the items are concerned with an orientation towards investigation - exploration in order to understand the particular phenomenon specified

in the item content. The factor solutions reported also suggested a division within the items which matches a difference in item content: exploration of ideas or exploration of complex mechanical phenomena.

For the breadth subscale there were five factors with eigen values greater than one, and these five factors accounted for 31.9, 9.1, 5.4, 5.3, and 5.1 percent of the total variance respectively. The relatively large proportion of the variance accounted for by the first of these factors suggests one general factor underlying the responses to the items which make up the breadth subscale. As with the analysis of the depth subscale the effects of performing separate rotations of two and three factors were investigated. The factor loadings for the items from the breadth subscale for these analyses are presented in Appendix R.

The pattern of loadings when two factors were rotated indicated two sets of items with some overlapping. Three items had loadings on both factors (Item 01: $F_1 = .46$, $F_2 = .30$; Item 23: $F_1 = .39$, $F_2 = .49$; and Item 31: $F_1 = .37$, $F_2 = .30$). Rotation of three factors produced a solution with Factors 1 and 2 substantially the same as those in the two factor solution, and a third factor made up of four items which also loaded on Factor 1.

All of the items on the breadth subscale specify activities which involve exploration of experience. The types of experiences generally imply some uncertainty as to their outcome and hence involve a form of risk. The item with the highest loading on Factor 1 for both the two and three-factor rotations was Item 05 ("Riding the rapids in a swift moving stream") indicating an emphasis in these items on exploring

daring and thrilling activities. For Factor 2 in both solutions the item with the highest loading was Item 18 ("Walking into an old deserted house at midnight") grouping with it items with some fear connotations. The four items which loaded on both Factor 1 and 3 in the three-factor solution were all items which involved some form of thrilling or daring water activity. This type of grouping suggested that further factoring was producing specific rather than general groupings.

Considering together the amount of variance explained by the factors and the groupings produced by rotation of them, it appears likely that there is a general factor within this subscale together with a division between items concerned with "thrilling" activities and those concerned with "frightening" activities.

Scale Characteristics: Depth and Breadth Subscales

The basic scale characteristics for the two subscales of the Two Factor Curiosity Scale when administered to the present group of respondents are summarized in Table 7.5.

The summary statistics presented in Table 7.5 indicate that scores on the breadth subscale were generally higher than those on the depth subscale. Both subscales had a high degree of internal consistency, well in excess of the .60 requirement that Nunnally (1967) suggests as a minimum for basic research purposes, and approximating the .90 level he suggests as being necessary for applied settings. The Kolmogorov-Smirnov test assesses the degree to which a

Table 7.5
 Scale Characteristics: Depth and Breadth Subscales
 (N = 609)

	DEPTH	BREADTH
Mdn	49.40	59.72
\bar{M}	49.30	58.41
\bar{SD}	9.60	10.55
alpha	.88	.88
Kolmogorov-Smirnov ^a :		
$\frac{Z}{P}$.85	1.99
	.47	.001

^aTwo-tailed test.

particular distribution of scores approximates that of a specified distribution, in this instance the normal distribution. The results of this test applied to the distributions of scores on the breadth and depth subscales indicated that the depth subscale distribution was not significantly different from a normal distribution; the breadth subscale distribution of scores did differ significantly. The forms of these distributions are presented in Figure 7.2. As can clearly be seen from Figure 7.2 the distribution of scores on the breadth subscale had a negative skew.

Similar summary statistics were prepared for the female and male responses separately. The results are presented in Table 7.6. When the subscale scores were grouped according to the sex of the respondent there were significant differences between the mean scores for the

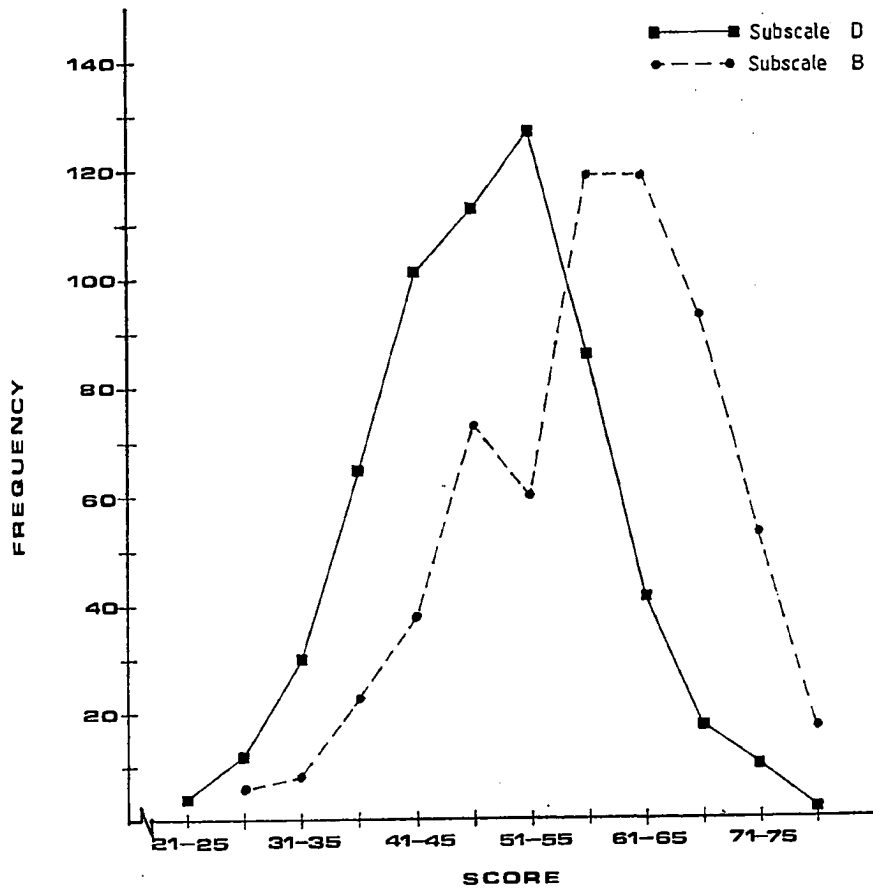


Figure 7.2 Frequency Distribution: Scores on breadth and depth subscales

groups. The difference was more pronounced with the scores on the breadth subscale than it was on the depth subscale. In both cases the difference was in the direction of the male respondents scoring higher than the female respondents. Although there were significant differences between the means of these distributions, the effect sizes were relatively small. A further indication that the effect size was small is given by the correlation coefficients between sex (male was scored 1, female 2) and subscale scores. For the depth subscale the value of the correlation coefficient was $-.14$, and for the breadth subscale was $-.26$.

Table 7.6
Scale Characteristics by Sex: Depth and Breadth Subscales

	DEPTH		BREADTH	
	Female	Male	Female	Male
<u>Mdn</u>	47.32	50.68	56.79	61.53
<u>M^a</u>	47.76	50.42	55.27	60.71
<u>SD</u>	9.16	9.81	10.48	10.01
alpha	.87	.89	.87	.88
Kolmogorov-Smirnov ^b :				
<u>z</u>	.83	.76	1.34	1.53
<u>p</u>	.50	.61	.06	.02
	Females: <u>n</u> = 258		Males: <u>n</u> = 351	

^aSample 1: $F=11.55$, (1,607), $p<.001$; Sample 2: $F=42.21$, (1,607), $p<.001$.

^bTwo-tailed test

Inspection of the values of coefficient alpha shows that similarly high levels of internal consistency were observed for both male and female groups. The distributions for the depth subscale both approximated normal, while the negative skew in the distribution of scores on the breadth subscale was more pronounced for the males than for the females. These distributions are shown in Figures 7.3 and 7.4.

The correlation coefficient between age and scores on the two subscales was zero for the depth subscale and $-.26$ for the breadth subscale. The current sample had a very narrow age range (13 years 11 months to 16 years 9 months) and therefore the computed correlation coefficients do not necessarily allow for generalization to a wider population.

A Comparison with the Scale Scores in Chapter Six

In the initial construction of the test a crossvalidation was conducted using a group of teacher education students. The present sample differed from that group in size, age and heterogeneity of interests. Although it is not valid to perform inferential statistical analyses on the scores for the two groups a descriptive comparison highlights the consistency of the structure of the Two Factor Curiosity Scale.

Table 7.7 summarizing the factor structure of the scale for the two samples, indicates clearly the similarity of the size of the factors which characterize the item responses.

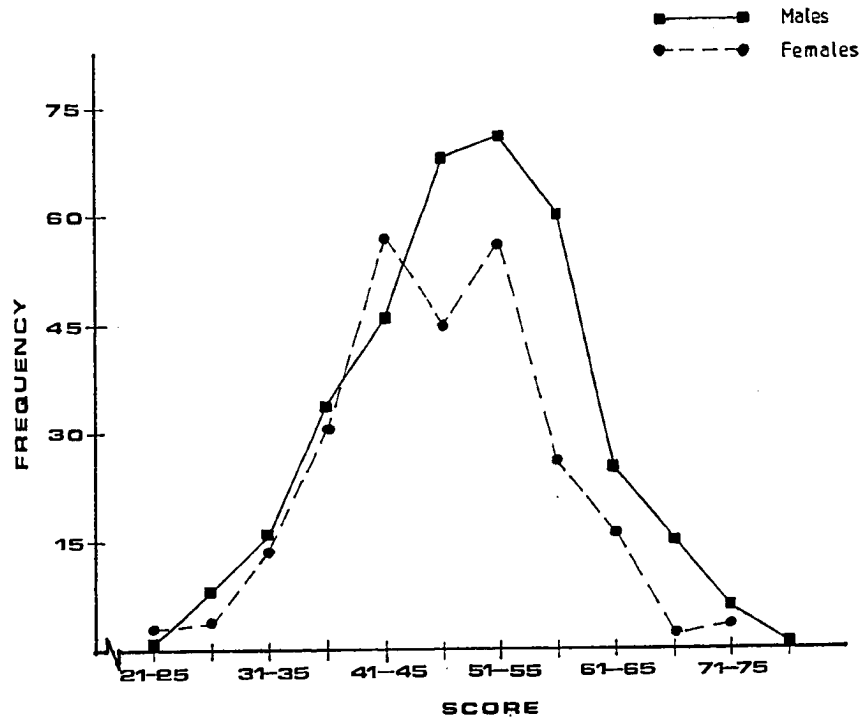


Figure 7.3 Frequency distribution: Sex by scores on the depth subscale

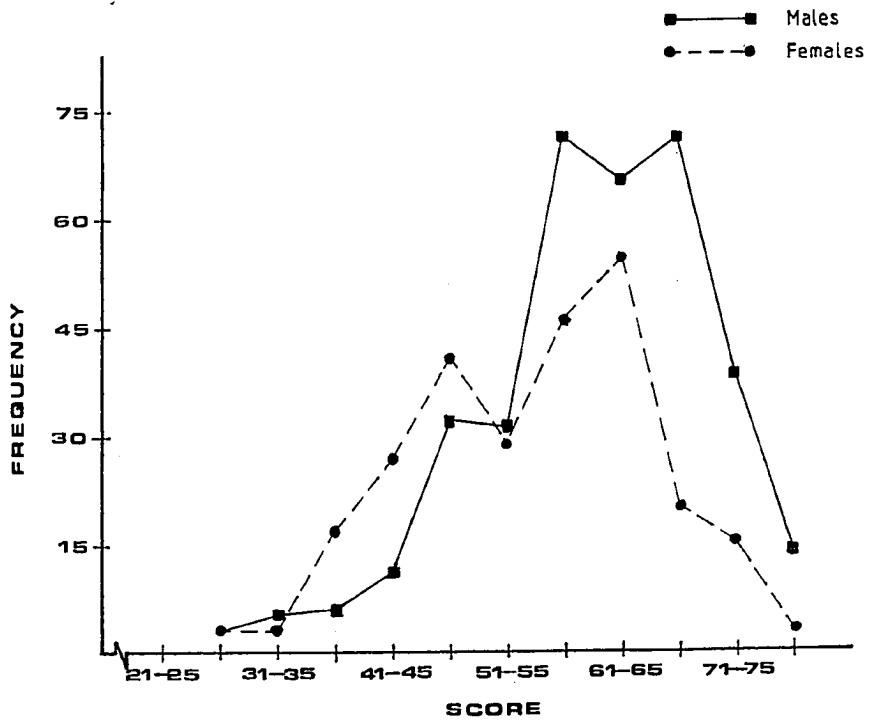


Figure 7.4 Frequency distribution: Sex by scores on the breadth subscale

Table 7.7
Factor Structure of the Two Factor Curiosity Scale: Two Samples

FACTOR	Eigen Value ^a		Percent Variance	
	SAMPLE 1	SAMPLE 2	SAMPLE 1	SAMPLE 2
1	7.59	7.65	19.0	19.1
2	6.65	5.25	16.6	13.1
3	2.72	2.84	6.8	7.1
4	1.74	1.84	4.3	4.7
5	1.47	1.27	3.7	3.2
6	1.37	1.18	3.4	3.0
7	1.20	1.12	3.0	2.8
8	1.17	1.06	2.9	2.7
9	1.06		2.6	
10	1.04		2.6	

Sample 1: N = 171 Sample 2: N = 609

Note. The complete tables of principal factors for each of these analyses appear in Appendix E and Appendix O.

^aOnly eigen values >1.0 have been entered.

Summary characteristics for the distribution of scores over the two subscales for the two validation study samples are presented in Table 7.8.

The summary statistics presented in Table 7.8 suggest that there were some differences in the level of scores for the two participating groups. The group designated Sample 1 had a higher mean score on the depth subscale and the group designated Sample 2 scored higher on the breadth subscale. This pattern of differences in mean scores is consistent with differences in the nature of the two groups. As indicated in the introductory comments to this chapter, the

Table 7.8
Scale Characteristics for Depth and Breadth Subscales:
Two Samples

	DEPTH		BREADTH	
	Sample 1	Sample 2	Sample 1	Sample 2
<u>Mdn</u>	53.64	49.40	56.75	59.72
<u>M</u>	54.04	49.30	55.61	58.41
<u>SD</u>	9.26	9.60	11.61	10.55
	Sample 1: <u>N</u> = 171		Sample 2: <u>N</u> = 609	

respondents who made up Sample 2 consisted of all Year 10 students in the participating schools. Therefore, it is reasonable to assume that they represent a relatively broader range of interests than the participants in Sample 1 who were all teacher education students. The depth subscale is composed of items concerned with an interest in finding solutions to problems or puzzling phenomena, items more likely to be consistent with the interests of a group of students undertaking tertiary studies.

The slightly higher mean score for Sample 2 on the breadth subscale is consistent with that group's age level and sex composition. It has been suggested earlier, in the discussions of the results for each sample separately, that the results point to a negative relationship between scores on the breadth subscale and the

respondent's age. The members of Sample 2 were all younger and had a much narrower range of age represented than was the case with Sample 1. The median age for Sample 1 was 20 years. Seventy percent of this group were aged between 17 and 27 years and the other thirty percent had ages ranging up to 51 years. Sample 2 had ages ranging from 13 years and 11 months to 16 years and 9 months with a median age of 15 years. The correlation coefficients reported in both this chapter, and the preceding one, indicated a relationship between sex and scores on the breadth subscale in the direction of males scoring higher than females. Given that Sample 2 contained a higher proportion of males than did Sample 1, the mean scores reported in Table 7.8 are consistent with those earlier results.

Demographic characteristics of the particular groups also account for the difference between the form of the distribution of scores on the breadth subscale over these two samples. The Sample 1 distribution of scores on the breadth subscale was not significantly different to a normal distribution. That for Sample 2 had a slight negative skew. This difference in the form of the distribution is consistent with the pattern of relationships of the breadth subscale scores and the variables of respondent's age and sex. Sample 2 was a younger group and had a higher proportion of males than was the case in Sample 1. Having more, and younger, male respondents could account for the clustering of scores above the mean in the Sample 2 distribution.

The Two Factor Curiosity Scale and General Ability

The SCAT was administered to all respondents at the same time as the Two Factor Curiosity Scale. The SCAT - School and College Ability Tests (SCAT Series 11, 1973) - is a measure of basic verbal and quantitative abilities and was designed for the purpose of predicting academic performance. Analysis of the relationships between scores on the SCAT and those on the breadth and depth subscales of the Two Factor Curiosity Scale allows an assessment of the degree of separation between the curiosity dimensions and those of general verbal and quantitative abilities.

Table 7.9
Verbal and Quantitative SCAT Scores^a (N = 609)

	Verbal	Quantitative	Total
<u>M</u>	96.77	96.14	95.97
<u>SD</u>	15.21	15.83	15.88

^aRaw scores were converted to quotients for calculation of these means.

The means and standard deviations for the verbal, quantitative, and total SCAT scores presented in Table 7.9 suggest that both the range and average level of ability within the group were close to the norm of the general population. The means for the verbal and

quantitative scales were almost identical.

The raw scores on the SCAT were then correlated with scores on the breadth and depth subscales of the Two Factor Curiosity Scale. The resulting correlations are presented in Table 7.10.

Table 7.10
Correlation Coefficients: Depth and Breadth Subscales by
SCAT Scores ($N = 609$)

Variable	DEPTH	BREADTH
SCAT Verbal	.15*	.17*
SCAT Quantitative	.22*	.18*
SCAT Total	.20*	.19*

* $p < .001$

The correlations reported in Table 7.10 show that scores on the breadth and depth subscales had a small positive association with the measures of general ability. These values although significantly greater than zero indicated that there was only a small degree of overlap between these variables. In the previous chapter the reported correlation between the two curiosity styles and a measure of general ability (ACER-AL) was .06 for the depth subscale and .07 for the breadth subscale. These values are probably an underestimate of the relationship between the variables because of the relatively narrow range of ability represented in the test group. In that case the group

consisted of tertiary students and their scores on the test of ability used (ACER-AL) indicated a mean score of 122, with scores ranging from 107 to 135+. The values presented in Table 7.10, based as they are on a test group with a wide range of ability, are consistent with the main body of findings in the research literature. These point to a small positive correlation between curiosity and general ability (e.g., Coie, 1974; Day & Langevin, 1969; Naylor, 1981; Penney & McCann, 1964; Vidler & Rawan, 1974; Zuckerman, 1975).

Summary and Conclusions

The results obtained in the analyses that have been reported in this and the preceding chapter present a highly consistent picture, and one which supports the general proposition being advanced in this thesis, that is, that curiosity can best be represented as a construct embracing two separate styles of behaviour: breadth of interest and depth of interest.

Rotation of the first two factors of each principal factors solution produced a clear separation of the breadth and depth subscale items. All of the items on the depth subscale are concerned with an orientation towards investigation and exploration in order to understand the particular phenomenon specified in the item content. These items represent a depth of interest curiosity style. All of the items on the breadth subscale involve exploration of new experience. The types of experiences generally imply some uncertainty as to their outcome and hence involve a form of risk for the participant. These items represent a breadth of interest curiosity style.

Three-factor rotations produced patterns of factor loadings which in each case amounted to a split within the depth subscale items. This split can be characterised as one between items concerned with the exploration and analysis of ideas, and items concerned with seeking to explore mechanical problems and phenomena. Four-factor rotations produced item loadings which divided the breadth subscale items into two groupings: items indicating a desire to participate in "thrilling" activities, and items specifying a desire to participate in "frightening" activities. Apart from a few individual items which varied from the general pattern in one or other of the analyses, there were consistent groupings irrespective of whether the set of responses were those of the total group or those for one of the sex groupings.

Examination of the psychometric properties of the breadth and depth subscales of the Two Factor Curiosity Scale indicates that they are sound measures. The internal consistency index for each subscale was of the order of .87 to .89. The distributions of scores indicated that the full range of the test was being used. For the groups reported both in this and the preceding chapter, the distribution of scores on the depth subscale did not differ significantly from the theoretical normal distribution. The form of the distribution on the breadth subscale showed some variation according to the sex and age composition of the respondents. For the group whose scores were reported in Chapter Six, the breadth subscale score distribution did not deviate significantly from normal. However, for the group whose scores have been detailed in the present chapter, the distribution of scores on this subscale did show a small deviation from normal; the distribution was negatively skewed. This group had many more males

participating than did the earlier group and they were on the average five years younger.

Scores on the breadth subscale have been shown to be negatively related to both sex and age of the respondent: males scored higher than females and those of a younger age scored higher than those who are older. This conclusion is limited to those ages which have been represented in the groups who have participated. A large group of 13 to 17 year-olds participated in the study reported in this chapter, while a smaller group, mainly in their early twenties though with some representation of ages beyond thirty years, participated in the Chapter Six crossvalidation study. Correlations between the respondent variables of sex and age, and the scores obtained on the depth subscale, were not significantly greater than zero for any of the groups reported.

Data reported in both of these chapters suggests that breadth and depth of interest curiosity styles are dimensions which can be distinguished from general ability. Scores from a group which showed a wide range of ability yielded a small association with the ability measures. These correlation coefficients were of the order of .15 to .22 thereby warranting the conclusion that the breadth and depth of interest curiosity subscales are not simply measuring something very closely related to general ability.

It has been argued throughout this thesis that curiosity can best be represented as a construct embracing two separate styles of behaviour: breadth of interest curiosity and depth of interest curiosity. The analyses that have been reported in this chapter and in

Chapter Six present a consistent pattern of results which indicate that the Two Factor Curiosity Scale has sound psychometric properties, and that it distinguishes clearly between the two curiosity dimensions: breadth of interest curiosity and depth of interest curiosity.

CHAPTER 8

CURIOSITY AND OCCUPATIONAL INTERESTS

Overview. Chapters Six and Seven have detailed the construction and development of the Two Factor Curiosity scale designed to measure both breadth and depth of interest curiosity dimensions. The results reported in Chapter Seven indicated the stability of the internal structure of this scale when it was administered to a group differing both in age level and range of ability from the group whose responses were used in the scale's development.

This chapter reports the details of a study designed to assess the construct validity of the Two Factor Curiosity scale by relating the curiosity style scores to scores obtained on an occupational interest inventory. Discriminant function analyses were used to determine which combination of variables from the occupational interest inventory maximally discriminated the curiosity style groups. The results of these analyses indicated that across the different occupational interest indices there was one consistent function which accounted for a large percentage of the variance between the curiosity style groups. Examination of the substantive nature of this function indicated that the Two Factor Curiosity scale has a high degree of construct validity.

It has been argued in earlier chapters that the construct of curiosity as it has appeared in the psychological literature is best understood as one embracing two distinct dimensions: curiosity expressed through breadth of interest on the one hand, and depth of interest on the other. Both dimensions involve approach to novelty but the forms of novelty which prompt approach are distinctively different. The breadth of interest curiosity style consists of a positive orientation towards varied and changing experiences; a wanting to know expressed in sampling new sensations and experiences. The depth of interest curiosity style consists of a positive

orientation towards complex ideas and puzzling phenomena; a wanting to know expressed in seeking to solve and understand the particular puzzling phenomenon. If the subscales of the Two Factor Curiosity Scale are valid measures of these motivational orientations, they will relate in systematic ways to other measures which are attempting to classify particular aspects of an individual's motivational orientations. The particular measure used in this study was the Career Assessment Inventory (CAI; Johansson, 1982) which contains within its structure a number of different indices which have been used widely in the assessment of vocational interests and preferences. The relationship between scores on the two curiosity style measures and scores on the CAI indices were used as a test of the construct validity of the Two Factor Curiosity Scale.

Method

The Two Factor Curiosity Scale and the Career Assessment Inventory (CAI; Johansson, 1982) were administered to 609 Year 10 students from seven non-government schools in metropolitan Melbourne. This group was the same group whose scores on the Two Factor Curiosity Scale were examined in Chapter Seven. The group consisted of 258 female and 351 male students with a median age of 15 years.

Discriminant function analyses (SPSS; Hull & Nie, 1981) were used to determine that combination of variables from the CAI indices which maximally discriminated high and low scorers on each of the two curiosity style dimensions.

Discriminant function analysis is used in multivariate research for a variety of purposes. Huberty (1975) distinguished four aspects: separation, discrimination, estimation, and classification. In the results reported here it is the second of these aspects (discrimination) which is emphasized. Huberty (1975) described "discrimination" as "studying group separation with respect to dimensions and to (discriminator) variable contribution to separation" (Huberty, 1975, p. 545).

Breadth of interest and depth of interest curiosity dimensions as measured by the Two Factor Curiosity Scale are orthogonal. Using a median split on each of the curiosity dimensions it was possible to construct four "curiosity style" groups of approximately equal size, and each representing a different combination of the two basic curiosity dimensions. The groups were: low breadth/low depth, low breadth/high depth, high breadth/low depth, and high breadth/high depth.

Discriminant function analysis was applied to the present set of data to determine which linear combinations from each set of CAI indices provided maximum discrimination between the "curiosity style" groups. Because the study reported in this chapter was basically concerned with establishing the construct validity of the subscales of the Two Factor Curiosity Scale, it was important to attempt substantive interpretation of the resulting linear discriminant functions. To achieve this the correlations of the discriminating variables with the linear discriminant functions were examined. Huberty (1975) and Tatsuoka (1973) both recommend this procedure

rather than one which uses the standardized canonical discriminant function coefficients because the latter:

Are actually partial coefficients and, hence, do not pertain to the common parts among the discriminators; two discriminators having large positive coefficients would not necessarily have anything in common that contributed to group separation.

(Huberty, 1975, p. 552)

Responses to The Career Assessment Inventory yield a number of different types of index: non-occupational indices, general vocational themes, and basic interest areas. The pattern of relationships between each of these CAI indices and the two curiosity styles were examined.

Non-occupational Indices and the Two Factor Curiosity Scale

There are four non-occupational indices in the CAI: Educational Orientation (EOR), Variability of Interests (VARINTER), Fine Arts-Mechanical (ARTMEC), and Occupational Extroversion-Introversion (E-I).

The Educational Orientation (EOR) variable was designed to operate as a measure of how comfortable a person is likely to be in an academic environment. In developing the scale Johansson (1982) used length of educational attendance as the criterion. The particular measure used was that of terminal educational level. The focus of this index is one of participation in an educational milieu rather than the particular level of achievement. Other similar scales have generally used academic achievement as the criterion (e.g. Strong Vocational Interest Blank, see Campbell and Johansson, 1966). The educational orientation variable is described by Johansson (1982) in the following

way:

This scale measures an individual's interest and preference toward the educational environment. In general, the higher the score, the greater the preference for school work and the academic milieu; the lower the score, the greater the dislike for these areas....

The scale measures interests, not potential academic achievement. There is no reason to conclude that someone with a low score will not succeed in higher education; the correct conclusion would be that such an individual would not find the educational milieu particularly interesting and probably would not enjoy discussing some of the more esoteric aspects of campus life with other students. Likewise, a high score should not be associated with predictions of success or persistence in a postsecondary endeavour. It would indicate only that the individual has interests similar to those who have achieved persistence in the liberal arts environment.

(Johansson, 1982, pp. 31-32)

This scale would be expected to make a substantial contribution to any combination of the non-occupational indices which discriminates between the curiosity style groups. The person who expresses a liking for activities which involve exploring and seeking to understand complex ideas and puzzling phenomena would be expected also to have a high score on a scale designed to measure one's orientation towards participation in an educational environment. In theory these two variables are measuring closely related constructs.

The Variability of Interests Scale (VARINTER) as the title suggests was designed as a measure of the individual's diversity of interests. A high score on this scale is interpreted to mean that the person has:

A preference for a wide range of diverse and unrelated activities... The individual may have a high degree of confidence in being successful at anything tried and therefore finds life to be challenging and positive.

Also, high scores may reflect a response style of "liking" items that reflect untried and unknown experiences.

(Johansson, 1982, p. 33)

This description of the meaning of the Variability of Interests scale suggests that it is likely to contribute to any discriminant function from the non-occupational indices which distinguishes between different curiosity style groups. The construct of curiosity which has been advanced in this thesis views both curiosity dimensions as being fundamentally concerned with approach to novelty, variation and change. To the extent that it measures a response style of approach to "untried and unknown experiences" it is measuring a construct closely allied with breadth of interest curiosity.

The Fine Arts-Mechanical Scale (ARTMEC) of the Career Assessment Inventory was designed to measure a dimension which has "fine-arts, creative and culturally oriented interests" at one end, and, "mechanical, skilled trades, and outdoor interests" at the other end. This scale is very strongly related to conventional sex-role stereotypes.

High scores reflect an overall preference for many mechanical activities and occupations and also indicate an overall dislike or indifference for cultural, aesthetic, and creative activities and occupations....

Low scores reflect an overall preference for aesthetic activities and an overall dislike or indifference to mechanical and skilled trades activities and careers.

(Johansson, 1982, pp. 25-26)

The breadth of interest curiosity scale with its emphasis on seeking to participate in new thrilling and daring experiences would be expected to relate positively with the activities and preferences

typical of the Fine Arts-Mechanical index.

The fourth of the non-occupational indices is referred to as Occupational Extroversion-Introversion (E-I). Those with high scores on this scale indicate:

Preferences that are very similar to those of people who like to work alone or with very small groups of co-workers... High scores also are a result of having a general dislike for trying to persuade or convince people and of having a dislike for many social-service types of occupations....

Low scores indicate:

A strong preference for working with others and helping others... This orientation lends itself to careers that involve interpersonal interaction such as social-service careers and sales careers. In contrast, individuals with a things orientation will tend to have high scores reflecting preferences for skilled trades and outdoor vocations.

(Johansson, 1982, p. 28)

This description suggests that Occupational Introversion can be represented as a "things" orientation; Occupational Extroversion as a "people" orientation. As such it does not have a clear overlap with either of the breadth or depth of interest curiosity dimensions.

Examination of these descriptions of the non-occupational indices of the CAI leads to the following prediction:

The Educational Orientation (EOR) and Variability of Interests (VARINTER) indices will be the two most important of the non-occupational indices in describing that function which best discriminates between the curiosity style groupings. Expressed in terms of the discriminant function analysis results, this means that

these two indices will have the highest correlations with the first significant discriminant function.

Results

Three of the non-occupational indices (E-I, ARTMEC, and VARINTER) of the CAI (Johansson, 1982) are scored using standardized I-scores (i.e. scores with a mean equal to 50 and a standard deviation equal to 10). The scores from the group reported here (see Appendix S) differed from this pattern in some important ways. On the E-I index the mean for the group was one half of a standard deviation higher than the norm and the standard deviation was considerably larger, indicating a wide dispersion of scores around that mean. The ARTMEC index mean was consistent with the scale norm, but as was the case with the E-I index, the standard deviation was much larger than the scale norm. The mean on the VARINTER index was approximately one half of one standard deviation lower than the scale norm but the spread of scores around the mean was comparable with that expected. The EOR index does not follow a 50/10 standardization. However, the test manual does report norms for adult groups defined in terms of their length of educational involvement. Johansson (1982, p.30) reports a mean of 30.4 (SD = 17.0) for adult females with a "high school only" level of education and a mean of 31.6 (SD = 16.2) for comparable adult males. The group whose results are reported in this chapter although much younger than this adult norming group had a similar pattern of responses; a mean of 30.53 and a standard deviation of 15.48.

Discriminant function analyses (Hull & Nie, 1981) were performed

to determine if the non-occupational indices of the CAI (Johansson, 1982) distinguished between criterion groups defined in terms of distinct combinations of the breadth and depth of interest curiosity styles. The criterion groups which were established consisted of the four combinations produced by a median split on the distribution for each of the two curiosity styles: low breadth/low depth (LOW/LOW; $n = 166$), low breadth/high depth (LOW/HIGH; $n = 132$), high breadth/low depth (HIGH/LOW; $n = 141$), and high breadth/high depth (HIGH/HIGH; $n = 170$). The means for each of these groups on the four non-occupational indices are presented in Appendix S, Table S.2.

All of the non-occupational indices separated the four curiosity style groups. (Appendix S, Table S.3 presents the univariate F ratios for the discriminating variables, and Table S.4 the canonical discriminant functions table for this analysis.) These results from the discriminant function analysis indicated that there were three functions which discriminated between the curiosity style criterion groups ($p < .05$). The correlations between the discriminant functions and the discriminating variables are presented in Table 8.1. (The standardized function coefficients for this analysis are presented in the Appendix, Table S.5.)

Inspection of Table 8.1 indicates that the first significant function which accounted for 88.41 percent of the total variance (see Table S.4, Appendix S) ordered in importance these variables as Educational Orientation, Variability of Interests, followed by Fine Arts-Mechanical, and with a smaller value Occupational Extroversion-Introversion. By far the largest of these correlations was that

Table 8.1
Discriminant Function Analysis: Correlations^a
Curiosity Style by Non-occupational Indices

Index	Function 1	Function 2	Function 3
EOR	-.81	.57	-.07
E-I	.31	-.11	.48
ARTMEC	-.42	-.60	-.08
VARINTER	-.61	-.28	.39

^aPooled within groups correlations between canonical discriminant functions and discriminating variables.

between the discriminant function and Educational Orientation. The pattern of interests represented by one end of this function involves: expression of a strong preference for activities typical of an educational milieu, a wide range of interests, some predominance of mechanical over fine arts interests, and a slight preference for situations which involve working with and helping others rather than working alone. The opposite end of the dimension represented by this discriminant function grouped preferences away from an educational milieu, a relatively narrower range of interests, some predominance of fine-arts over mechanical interests, and a liking for working alone.

The second significant discriminant function accounting for 8.79 percent of the total variation, was marked by a strong negative correlation with the Fine Arts-Mechanical index. This was coupled with a marginally smaller but positive correlation between Function 2 and

the Educational Orientation index. The Variability of Interests and Occupational Extroversion-Introversion indices both had small negative correlations with Function 2. A pattern of preferences grouping "fine arts" interests and an orientation towards feeling comfortable in an educational milieu, characterizes the positive end of this dimension.

There were moderate positive correlations between both the Occupational Extroversion-Introversion and Variability of Interests indices and the third significant discriminant function. This third function accounted for only a very small percentage of the total variance (2.80 percent). One end of this function was characterized by a preference for working with and helping others rather than working alone, together with a narrow range of interests, the other end, the reverse combination.

In the results of a linear discriminant function analysis the group centroids indicate the positioning of the groups on the particular function in terms of standard deviation units. Table 8.2 indicates that the distance between the groups on the first of the discriminant functions was much wider than that on either of the other two.

Function 1 positioned the low breadth/low depth group on one end of the dimension and the high breadth/high depth combination on the other end, more than one and one half standard deviation units apart. The low breadth/high depth group was on the same side of the function mean as was the high breadth/high depth group, while the high breadth/low depth group was positioned on the same side of the function mean as the low breadth/low depth group. The Function 1 mean separated the

Table 8.2
Group Centroids
Curiosity Style by Non-occupational Indices

Group Breadth/Depth	Function 1	Function 2	Function 3
LOW/LOW	.82	.04	.09
LOW/HIGH	-.30	.31	.08
HIGH/LOW	.17	-.22	-.15
HIGH/HIGH	-.71	-.10	.10

high and low depth of interest groups. However, all four group centroids were spaced approximately one half of one standard deviation apart suggesting that this function was discriminating between all of the groups and not just between the extreme groups.

As would be expected from the very small percentage of total variance accounted for by Functions 2 and 3, the dispersion of centroids around the means for these functions was considerably narrower than was the case for Function 1. On Function 2 (8.79 percent of the total variance) there was approximately one half of a standard deviation distance between the extreme groups. The low breadth/high depth group centroid was .31 of a standard deviation above the function mean while the high breadth/low depth group centroid was .22 of a standard deviation below the function mean. Inspection of these centroids suggests that this function was discriminating between these two extreme groups.

On Function 3 (2.80 percent of the total variance) there was only a very small difference between the positioning of the extreme groups. The high breadth/low depth group centroid was .15 of a standard deviation below the function mean and the high breadth/high depth group at the other extreme, was .10 of a standard deviation above that mean.

Both Huberty (1975) and Cooley and Lohnes (1971) suggest that in most research applications the first two linear discriminant functions will account for a considerable proportion of the discriminatory power of the variables, and that consideration of functions beyond this point adds little to the interpretation of the configuration of the groups. Consideration of the amount of variance accounted for by the third function which the present analysis yielded confirms this position. The third significant function added only 2.80 to the percentage of the total variance explained.

Interpreting The Functions

To determine the nature of the particular discriminant functions and from there to comment on the construct validity of the Two Factor Curiosity scale requires an examination of the content of the non-occupational indices which showed strong correlations with the discriminant functions.

The pattern of correlations between the first discriminant function and the discriminating variables points to a particular set

of interests and preferences which represent important differences between the groups discriminated by that function. The variable which had the highest correlation with Function 1 was the Educational Orientation index. Hence, the members of the group with high scores on both of the curiosity style scales (high breadth/high depth) were more likely to express a stronger interest in participating in activities typical of an educational milieu. Preferences in this direction were also characteristic of the low breadth/high depth group.

Function 1 had a moderate correlation with the Variability of Interests index and so part of its substantive meaning involves a commonality between Educational Orientation scores and Variability of Interests scores: preference for an educational milieu together with a wide variety of interests at one end of the function, and preferences away from an educational milieu together with a narrow range of interests at the other end. Inspection of the content of some of the items which go to make up these scales indicates some of the possible points of overlap between them, points which are consistent with the fact that this function distinguishes clearly between the four curiosity style groups. The CAI manual (Johansson, 1982, p.25 - 33) outlines some of the items which make up the scales. Those items which are scored in the positive direction on the Educational Orientation index concern studying or working intensively with particular areas of knowledge ("Study Geometry", "Work with a chemistry set"), participation in cultural pursuits such as concerts ("Go to a symphony/music concert"), or specify occupations which involve working in an educational environment ("Be a high school counselor"). There is a wide range of content specified in these items. Those items scored in the negative for this index involve work settings which are

typically repetitive and routine in nature ("Sort mail in a post office", "Shampoo hair in a beauty shop"). Higher scores on this scale therefore suggest an expressed preference for intellectual stimulation over a wide variety of content areas, and lower scores a preference for routine and order. The item content of the Variability of Interests index appears to represent an openness to trying new things ("Try new cooking recipes", "Make new friends"), and putting oneself in situations where change and variation are likely to occur ("Write a novel", "Drive on long journeys"). Represented in these items are situations where the experience of variation and change is in the form of sampling something new to find out what it is like, as well as situations which involve a more intensive exploration of a new phenomenon.

This analysis of the content of the items that go to make up the Educational Orientation and Variability of Interests indices, suggests that Function 1 represents a dimension which involves a preference for activities which lead to an increased awareness and understanding of events, ideas and natural phenomena. The positioning of the curiosity style groups along Function 1 is also consistent with this interpretation of its substantive meaning. The high breadth/high depth group showed the strongest preference for "activities which lead to an increased awareness and understanding of events, ideas and natural phenomena". Next was the low breadth/high depth group with preferences in the same direction as the first group but not as strong. The high breadth/low depth group was positioned on the other side of the function mean from these two high depth of interest curiosity groups, and the low breadth/low depth group expressed the least preference for "activities which lead to an awareness and

understanding of events, ideas and natural phenomena". The emphasis on the "educational" nature of the content of this function links it closely with the style of exploratory behaviour represented by the depth of interest curiosity style: an orientation towards exploring and investigating new objects, events, and ideas. The emphasis in the Variability of Interests index on experiencing variation and change is strongly suggestive of the orientation towards new experience expressed in the breadth of interest curiosity dimension, though as has been noted earlier, the content of the items on this scale appears to represent both a sampling of new experiences (breadth of interest), and more intensive investigation of new phenomena (depth of interest).

Function 1 also showed a small correlation with the Fine Arts-Mechanical index of the CAI. Scores at the "mechanical" end of the scale were associated with high scores on the Educational Orientation and Variability of Interests scales. The items on the "mechanical" end of this scale generally involve some understanding of the workings of the particular mechanical device specified in the item content ("Change oil in an automobile"), and sometimes specify an interest in finding out more about the workings of such devices ("Read popular mechanics magazines"). In contrast the items on the "fine arts" end of the scale appear to involve appreciation of aesthetics ("Attend a fashion show", "Be an interior decorator"). It is the "understanding the mechanics of" element of the items on the mechanical end of this scale which appears to be consistent with the other elements which correlate highly with Function 1.

In short, Function 1 appears to consist of a dimension representing a pattern of interests and preferences for engaging in

activities which lead to an increased awareness and understanding of events, ideas and mechanical phenomena.

Function 2, which was of much less significance in terms of its power to distinguish the curiosity style groups, linked scores on the "fine arts" end of the Fine Arts-Mechanical index together with higher scores on the Educational Orientation index. Two of the curiosity style groups' centroids are positioned close to the function mean and not very far apart (low breadth/low depth and high breadth/high depth). The high breadth/low depth centroid was a little more than .2 of a standard deviation below the function mean, while the fourth group's centroid (low breadth/high depth) occurred .3 of a standard deviation above the function mean.

The content of the items scored in the "fine arts" direction on the Fine Arts-Mechanical index appear to emphasize aesthetic appreciation ("Be a fashion designer", "Grow flowers"). To the extent that some of these items involve an understanding of the "craft" there is a commonality with the preference for activities directed towards understanding and appreciation of phenomena expressed in the item content of the Educational Orientation index. It was the low breadth/high depth curiosity group which was distinguished by this pattern of interests and preferences: a group who on the curiosity scales expressed an interest in finding out about and understanding new phenomena, but who were wary of participation in unknown, risky or daring new experiences.

Rotating the Discriminant Functions

The pattern of correlations between the discriminating variables and the discriminant functions presented in Table 8.1 is very similar in form to the pattern often found in a principal components analysis. Although rotation of the functions in a discriminant function analysis is not a commonly used procedure (Huberty, 1975, p. 553), it has been suggested by Cooley and Lohnes (1971) that rotation may assist in interpretation of the discriminant functions.

It may even be useful to Varimax or otherwise rotate the chosen discriminant factors rigidly to improve the interpretability of the reference vectors spanning the discriminating subspace.

(Cooley & Lohnes, 1971, p. 250)

Rotation of the function axes redistributes the variance such that the new (rotated) functions do not maximally discriminate between the groups. However, the positioning of the axes when rotated to a varimax solution can help to clarify the relationship between the groups and the discriminating variables.

Therefore, in order to explore the nature of the two discriminant functions a little further, they were rotated to a varimax solution. The results of this rotation of the function axes are presented in Tables 8.3 and 8.4, and the relationship between the axes for the unrotated and rotated solutions are presented in Figure 8.1.

Table 8.3
Discriminant Function Analysis: Correlations after Rotation^a
Curiosity Style by Non-occupational Indices

Index	Rotated Function 1	Rotated Function 2
EOR	.98	.02
E-I	-.32	-.10
ARTMEC	-.02	.74
VARINTER	.33	.59

^aCorrelations between rotated canonical discriminant functions and discriminating variables.

Table 8.4
Group Centroids (after rotation)
Curiosity Style by Non-occupational Indices

Group Breadth/Depth	Rotated Function 1	Rotated Function 2
LOW/LOW	-.64	-.52
LOW/HIGH	.43	-.07
HIGH/LOW	-.26	.07
HIGH/HIGH	.51	.50

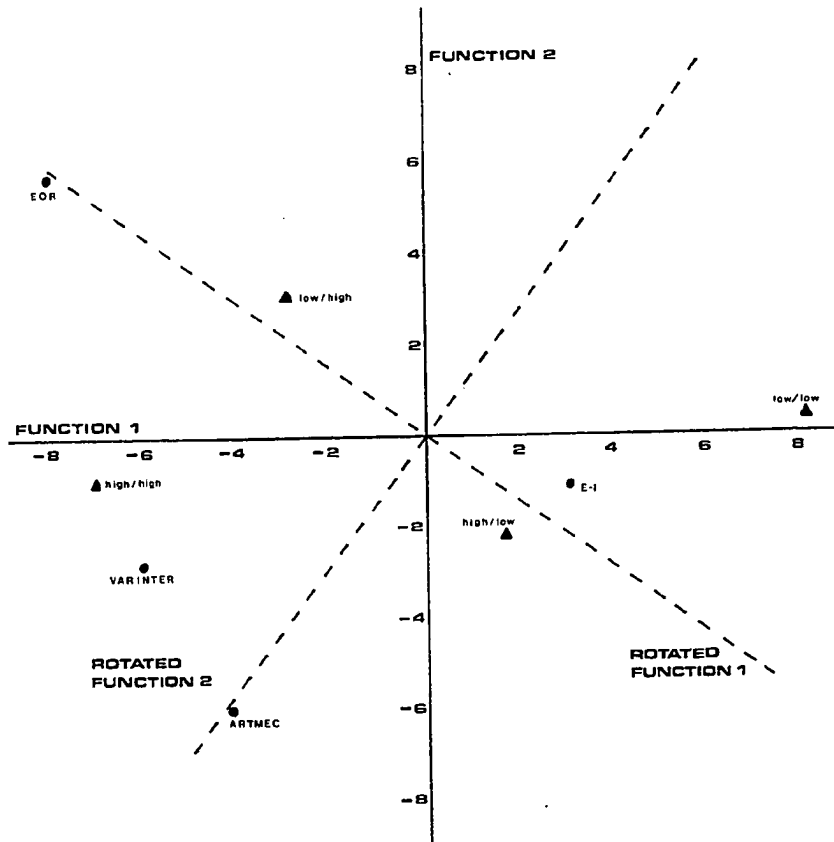


Figure 8.1 Rotated and unrotated axes:
Curiosity style by non-occupational indices

The main effect of the rotation of the axes was to distinguish between the patterns of discrimination associated with the Educational Orientation and Fine Arts-Mechanical indices of the CAI.

The new positions for the function axes indicated that rotated Function 1 consisted primarily of an Educational Orientation dimension (the EOR index correlated .98 with rotated Function 1), and rotated Function 2 a Fine Arts-Mechanical dimension (the ARTMEC index correlated .74 with rotated Function 2). For both of these indices the high loading on one function was coupled with a zero loading on the other function. The Variability of Interests index loaded on both of the rotated functions: a small loading (.33) on rotated Function 1 and a larger loading (.59) on rotated Function 2. Occupational Extroversion-Introversion had a small negative loading on rotated Function 1 (-.32) and a smaller negative loading on rotated Function 2 (-.10).

Examination of the position of the group centroids on rotated Function 1 (Table 8.4) indicated that basically this function discriminated between the groups in terms of the depth of interest scores. There was very little difference between the location on Function 1 for the high breadth/high depth (.51) and low breadth/high depth (.43) groups. These two groups' centroids were approximately .7 of a standard deviation higher on this function than was the high breadth/low depth group. The low breadth/low depth group's centroid was still further below the function mean but the margin of difference was not as pronounced as that between the low breadth/high depth group and the high breadth/low depth group.

This pattern of findings clearly indicates a strong relationship between the dimensions being measured by both the Educational Orientation index of the CAI and the depth of interest curiosity subscale of the Two Factor Curiosity Scale.

Rotated Function 2 was defined by the Fine Arts-Mechanical index of the CAI supported by a strong loading for the Variability of Interests index. This function appears to be discriminating between the two extreme combinations, high breadth/high depth and low breadth/low depth. These groups' centroids were equally spaced around the function mean while the centroids for both the high breadth/low depth and low breadth/high depth groups were positioned very close to that mean.

The position on rotated Function 2 of the high breadth/high depth group centroid (.50) indicated that this group was more likely to score at the mechanical end of the Fine Arts-Mechanical index, and was more likely to express a wide variety of interests. On the other hand, the low breadth/low depth group was more likely to have scores towards the fine arts end of the Fine Arts-Mechanical index together with scores indicative of a narrower range of interests on the Variability of Interests index.

Scores on the Fine Arts-Mechanical and Variability of Interests indices of the CAI were closely associated with two of the four curiosity styles defined by the intersection of the depth of interest and breadth of interest subscales of the Two Factor Curiosity Scale.

Analysis by Sex Groupings

Responses to the non-occupational indices of the CAI are not independent of the sex of the respondent. In fact the Fine Arts-Mechanical index is very strongly related to conventional sex-role stereotypes. The group of respondents who participated in the present study had a greater number of males than females (males: $n = 351$, females: $n = 258$). Any multicollinearity of sex and scores on the non-occupational indices may have distorted the patterns in the direction of those typical for the males in the group. (Appendix S, Table S.6, presents the means for females and males on each of the non-occupation indices.) The F ratios reported in that table indicate that there were strong differences between the scores of the females and the males for two of those indices. Males scored significantly higher than females on the Fine Arts-Mechanical and Occupational Extroversion-Introversion indices. These two indices had small correlations with Function 1, but the Fine Arts-Mechanical index had the highest correlation with Function 2.

Discriminant function analyses were performed using the female and male responses as separate groups. For both groups the respondents were divided into four curiosity style criterion groups using the respective median scores.¹ The means for these criterion groups on the non-occupational indices are presented in Appendix S, (Table S.7, and Table S.8).

¹Females: LOW/LOW $n=69$, LOW/HIGH $n=58$, HIGH/LOW $n=62$, HIGH/HIGH $n=69$.
Males: LOW/LOW $n=94$, LOW/HIGH $n=81$, HIGH/LOW $n=79$, HIGH/HIGH $n=97$.

All of the four non-occupational indices discriminated significantly between the curiosity style groups of both sexes. The univariate F ratios are presented in Appendix S: Table S.9, and Table S.10. Canonical discriminant functions tables for both sex groups are also presented in Appendix S: Table S.11 and Table S.12. For the female group there was only one significant function which accounted for 96.00 percent of the total variance. The male group analysis yielded three significant functions accounting for 76.42, 18.42, and 5.17 percent of the total variance.

The pattern of preferences and interests represented by each of these functions can be determined through an examination of the correlations between the canonical discriminant functions and the discriminating variables (Table 8.5). The standardized function coefficients for these analyses are presented in Appendix S.

For the female group Function 1 accounted for almost all of the variance (96.00 percent). The largest correlation with this function was that for the Educational Orientation index. The Variability of Interests index also had a large correlation with Function 1. This pattern was very similar to that found in the analysis for the total group, although the percentage of the variance accounted for by the first function was greater for the female group than it was for the total group. The Fine Arts-Mechanical and Occupational Extroversion-Introversion indices had correlations with the first function that were consistent with the pattern observed in the total group with respect to their direction. However, the size of these smaller correlations differed slightly. For the female group the Fine Arts-Mechanical correlation was smaller than for the total group, while the

Table 8.5
 Discriminant Function Analysis: Correlations^a
 Curiosity Style by Non-occupational Indices
 Females

Index	Function 1
EOR	-.86
E-I	.55
ARTMEC	-.28
VARINTER	-.71

^aPooled within groups correlations between canonical discriminant function and discriminating variables.

Table 8.6
 Group Centroids
 Curiosity Style by Non-occupational Indices
 Females

Group Breadth/Depth	Function 1
LOW/LOW	.77
LOW/HIGH	-.26
HIGH/LOW	.32
HIGH/HIGH	-.84

Occupational Extroversion-Introversion correlation was a little larger.

The group centroids for this analysis of the female responses (see Table 8.6) showed the same pattern of separation around the function mean as was observed in the total group data. The two extreme groups, low breadth/low depth and high breadth/high depth were separated by more than one and one half standard deviation units. The other two groups were ordered as high breadth/low depth and low breadth/high depth between the extremes, and approximately one half of a standard deviation separated all four groups.

For the female group of respondents preference for activities typical of an educational milieu, a wide range of interests and occupational extroversion were all associated with the combination of high breadth of interest curiosity and high depth of interest curiosity. The four curiosity style groups' centroids were spread along this function in a pattern which suggested that scores on the depth of interest curiosity dimension determined their positions above or below the function mean, while the inclusion of the breadth of interest curiosity dimension influenced how far from the mean any particular group's centroid occurred.

Function 1 for the male group accounted for 76.42 percent of the total variance. The correlations between the discriminant functions and the discriminating variables are detailed in Table 8.7. Function 1 had its highest correlation with the Educational Orientation index (-.82). The next highest correlation was with the Variability of Interests index (-.54), followed by Fine Arts-Mechanical and

Table 8.7
 Discriminant Function Analysis: Correlations^a
 Curiosity Style by Non-occupational Indices
 Males

Index	Function 1	Function 2	Function 3
EOR	-.82	.13	.45
E-I	.43	.78	-.30
ARTMEC	-.32	.04	-.52
VARINTER	-.54	-.30	-.44

^aPooled within groups correlations between canonical discriminant functions and discriminating variables.

Table 8.8
 Group Centroids
 Curiosity Style by Non-occupational Indices
 Males

Group Breadth/Depth	Function 1	Function 2	Function 3
LOW/LOW	.66	.20	-.09
LOW/HIGH	-.35	.25	.19
HIGH/LOW	.30	-.41	.10
HIGH/HIGH	-.60	-.07	-.15

Occupational Extroversion-Introversion with smaller correlations. Again the pattern of correlations is very similar to those obtained in the other analyses. The main difference between the patterns was the slightly smaller correlation for the Variability of Interests scale. Despite this difference in magnitude it still ranks as the second largest correlation. The percentage of the variance accounted for by this first function was slightly lower than that found in the set of responses from the female group, but still accounted for a considerable proportion of the total variance. At one end of the function are grouped preferences towards an educational milieu, a wide variety of interests, and to a lesser extent, mechanical interests, and a tendency towards a "people" rather than "things" orientation.

The group centroids (see Table 8.8) on Function 1 show exactly the same ordering on the function as was seen with the total group and the female responses. However, for the male group the distances between these centroids are slightly smaller than in either of the other two analyses.

The male group responses yielded a second significant function which accounted for a larger proportion of the variance (18.42 percent) than was the case for the total group responses (8.79 percent). This second function had a strong correlation with the Occupational Extroversion-Introversion index (.78). All of the other indices had very small correlations with Function 2. Consideration of these correlations suggests that for the male group this second function represents a "people" versus "things" orientation.

On Function 2 the centroid for the high breadth/high depth group

was close to the function mean; the low breadth/low depth and low breadth/high depth groups' centroids were close to one quarter of a standard deviation above the function mean, and the high breadth/low depth group's centroid was .4 of a standard deviation below the function mean. This suggests that the two extreme groups were distinguished by their preferences towards working with people or alone. The high breadth/low depth group showed a tendency towards liking to work with others, the low breadth/high depth group towards working alone.

The third significant discriminant function for the male group accounted for 5.17 percent of the total variance. All of the non-occupational indices had correlations between .30 and .50 with this function. The correlation between the Educational Orientation index and Function 3 was positive and the other three correlations were negative. The positions of the group centroids indicated that the small discrimination between the groups which this function showed was mainly a discrimination between the low breadth/high depth group and the high breadth/high depth group.

Following the procedure adopted with the results of the discriminant function analysis for the total set of responses, it was decided to rotate these functions to a varimax solution. The third significant function derived from the male responses accounted for a larger percentage of the variance (5.17) than was the case for the total group (2.80). It was therefore decided to rotate all three significant discriminant functions to a varimax solution. The results of this analysis are presented in Tables 8.9 and 8.10.

Table 8.9
 Discriminant Function Analysis: Correlations after Rotation^a
 Curiosity Style by Non-occupational Indices
 Males

Index	1	Rotated Function 2	3
EOR	.92	.07	-.20
E-I	-.22	-.05	.92
ARTMEC	.01	.60	.09
VARINTER	.11	.68	-.30

^aCorrelations between rotated canonical discriminant functions and discriminating variables.

Table 8.10
 Group Centroids (after rotation)
 Curiosity Style by Non-occupational Indices
 Males

Group Breadth/Depth	1	Rotated Function 2	3
LOW/LOW	-.50	-.31	.38
LOW/HIGH	.45	.02	.10
HIGH/LOW	-.33	-.21	-.33
HIGH/HIGH	.38	.46	-.18

Rotated Function 1 had a correlation of .92 with the Educational Orientation index and very small correlations with the other three variables. Rotated Function 2 had strong loadings for both the Fine Arts-Mechanical and Variability of Interests indices. The third function was primarily related to the Occupational Extroversion-Introversion index.

Rotated Functions 1 and 2 for the male group were very similar to those obtained from the total group. The only difference between the two rotated solutions was the pattern of loadings for the Variability of Interests index which for the total group showed a higher loading on rotated Function 1.

The location of each curiosity style group's centroid on the rotated functions was also similar to the pattern found in the total group results. Rotated Function 1 discriminated between the curiosity style groups in terms of the depth of interest curiosity scores. Those groups characterized by high depth of interest curiosity had centroids well above the function mean. Those groups defined by low depth of interest curiosity scores had centroids located well below the function mean.

As was the case with the total group, the second rotated function was basically discriminating between the high breadth/high depth combination and the low breadth/low depth combination. However, in the case of the male group this distinction was not quite as clear cut as it was for the total group. The high breadth/low depth group centroid for the males was slightly lower than the function mean (-.21) whereas for the total group it was almost on the function mean (.07).

Rotated Function 3 primarily distinguished between the curiosity style groups on the basis of breadth of interest curiosity scores. High breadth of interest curiosity groups' centroids were below the function mean, low breadth of interest curiosity groups' centroids were above the function mean. This function was also related to the depth of interest curiosity dimension in that the level of the depth of interest curiosity appears to have affected the distance of the group's centroid from the function mean. The differences between low and high breadth of interest curiosity groups on this function were greater when they occurred in combination with low depth of interest curiosity than when they occurred with high depth of interest curiosity.

Summary

It is evident from inspection of the discriminant functions derived from each of these sets of data that there is a common pattern in the correlations relating the discriminating variables and each of the first significant functions. The correlations between the discriminating variables and Function 1 showed a grouping of preferences for activities typical of an educational milieu and a wide variety of interests. To a lesser extent it also involved preferences for working with people rather than things, and mechanical rather than fine arts interests. This common pattern of correlations suggests that the same basic function has been shown to be operating in distinguishing the four curiosity style groups. That function appears to consist of expressions of preferences for and against activities

which lead to an increased experience and understanding of events, ideas and natural phenomena.

In each of the three analyses this function demonstrated the same ordering of the curiosity style groups. The function mean separated high depth of interest groups' centroids from low depth of interest groups' centroids. The breadth of interest curiosity levels appear to have had a parallel but secondary relationship to that of the depth of interest curiosity levels with Function 1. Low breadth of interest curiosity in combination with low depth of interest curiosity was associated with a greater distance from the function mean than high breadth of interest curiosity combined with low depth of interest curiosity. The same applies to the comparative positions of the high breadth/high depth and low breadth/high depth curiosity style groups.

The character of the second discriminant function was much less stable across the three analyses. When the total set of responses was analysed the second function grouped preferences for fine arts together with an orientation towards feeling comfortable in an educational milieu. The analysis for the female group produced only one significant discriminant function. The results for the male group indicated a second function which was an occupational extroversion-introversion dimension and a third function which contrasted the educational orientation index with the other non-occupational indices.

In order to explore the nature of these functions and their relationships with the breadth of interest and depth of interest curiosity dimensions further, the discriminant functions were rotated to a varimax criterion. Rotation was not possible in the case of the

female group as the results indicated only one significant discriminant function.

The rotated functions for the total group and for the male responses yielded very consistent patterns of results. The Educational Orientation index was shown to be closely related to the depth of interest curiosity dimension. The Fine Arts-Mechanical and Variability of Interests indices in combination distinguished between two of the four curiosity style groups: high breadth/high depth and low breadth/low depth. And, for the male group the Occupational Extroversion-Introversion index was related to breadth of interest curiosity.

The differences between these results over the three analyses are largely a function of differences between the males and females in their level of score on two of the CAI non-occupational indices: Fine Arts-Mechanical and Occupational Extroversion-Introversion. On both of these indices there were large differences between the scores for the two sex groups. Both indices have a 50/10 standardization of scores and on the Occupational Extroversion-Introversion index the mean for the males was one standard deviation higher than the expected mean, while that for the female group was very close to the 50 norm. On the Fine Arts-Mechanical index there was an even wider difference between the two means. The mean for the female group was more than one standard deviation below the norm while the mean for the males was one standard deviation higher than the norm.

The pattern of discrimination between the curiosity style groups provided by the non-occupational indices of the CAI is consistent with the construct validity of the Two Factor Curiosity Scale.

General Theme Scales and the Two Factor Curiosity Scale

The General Theme Scales of the CAI (Johansson, 1982) are based on the Holland (1973) model of vocational types and environments. Holland (1973) proposed that personality, especially as it relates to vocational interests and behaviour, can be represented in terms of six basic types: REALISTIC (R-Theme), INVESTIGATIVE (I-Theme), ARTISTIC (A-Theme), SOCIAL (S-Theme), ENTERPRISING (E-Theme), and CONVENTIONAL (C-Theme).

The R-Theme scale was designed to discriminate the REALISTIC personality type and distinguishes people who:

Like to work with their hands, with tools and machines to repair, build, and maintain things. They can be referred to as "doers," and they tend to be more technicians than scientists... Life is viewed as straightforward rather than as complex by people with high R-Theme scores. Briefly, groups of people with high R-Theme scores can be described as doers, rugged, tough, practical and unsophisticated.

(Johansson, 1982, p. 47)

The INVESTIGATIVE personality type is distinguished by high scores on the I-Theme scale. Such people:

Like to work in laboratories and be involved in scientific activities. They can be referred to as "thinkers," since they use their minds, charts, and data to solve puzzles and investigate how the world is put together... These workers value freedom and opportunity to satisfy their inner curiosity. Groups of people with high I-Theme scores can be described as thinkers, logical, rational, systematic, and scientific.

(Johansson, 1982, p. 47)

High scores on the A-Theme scale indicate the ARTISTIC personality type and are people who:

Like to work in creative endeavours. They can be

referred to as "creators," as they like to use their talents and originality to create unique products. They value opportunities to express themselves and be involved in creative projects... Groups of people with high A-Theme scores can be described as creators, musical, dramatic, introspective, and clever.
(Johansson, 1982, p.47)

The SOCIAL personality type is indicated by high scores on the S-Theme scale and is typical of people who:

Like to work in situations that permit them to help and assist others; they can be referred to as "helpers." They interact well with others, similar to E-Theme, and prefer to solve problems by talking things out... The purpose of life is viewed as service to others. Groups of people with high S-Theme scores can be described as humanistic, talkative, involved and sociable.

(Johansson, 1982, p.47)

The E-Theme scale is used to distinguish the ENTERPRISING personality type which represents people who:

Like to sell things or be in business. They can be referred to as "persuaders," since they like to use their talents in organizing, planning, selling, or persuading people to do something... Life is viewed in terms of power, status, and material wealth. Groups of people with high E-Theme scores can be described as persuaders, enterprising, competitive, ambitious, and assertive.

(Johansson, 1982 p. 47)

The sixth of these general theme scales is the C-Theme which represents the CONVENTIONAL personality type; the person who:

Likes to work with business details and with office practice types of work... They like to know exactly what is expected of them and what they are supposed to do. They have little interest in problems that require physical skills or problems that require a lot of creativity... Life is viewed as predictable and orderly - a place for everything and everything in its place. Groups of people who have high C-Theme scores can be described as organizers, mild, dependable, orderly, and precise.

(Johansson, 1982, p. 48)

These RIASEC themes are not independent. Holland (1973) has represented their interrelations in terms of a hexagonal model whereby

adjacent themes are assumed to be more similar than non-adjacent. On this basis R would be expected to be more similar to both C and I than it is to S. Holland (1973) has expressed this in terms of the similarity of types being inversely proportional to their distances on the hexagon. Diagonal opposites such as E and I, or R and S, should show least similarity. This proposal of a hexagonal arrangement of the relationships between types has not always been confirmed in the research which has grown out of Holland's formulation. Holland, Magoon, and Spokane (1981) reviewing the recent literature on career interventions concluded that some of the research results were clearly in support of the hexagonal model, others were negative sometimes supporting different hexagons. (See also Naylor and Mount, in press.) Johansson (1982) reports results from a "miscellaneous" sample obtained by mailing CAI forms to 2,000 home addresses randomly selected from telephone directories. This sample of 661 adults yielded a pattern of correlations between the themes more in the form of a linear relationship than a hexagonal one. The same ordering of the theme areas was observed (RIASEC), but the expected relationship between R and C was not forthcoming. In other samples Johansson (1982) has found support for the hexagonal arrangement of themes.

One of the key constructs in Holland's (1973) formulation is that of "subtypes" or "personality patterns". An individual's personality pattern is the particular profile of resemblances to the main personality types. It is by virtue of its appreciation of the importance of the patterning of individual interests and preferences that the Holland typology has the potential to represent the complexity of human personality. Differences in curiosity style as assessed by scores on the Two Factor Curiosity scale would therefore

be expected to correspond to different personality patterns as assessed by the RIASEC theme scores.

The description of the INVESTIGATIVE theme cited above, with its emphasis on choosing situations which allow opportunity to satisfy "inner curiosity", would be expected to assume a prominent place in those patterns of RIASEC themes which discriminate between high and low scorers on the curiosity dimensions. If the Two Factor Curiosity Scale is a valid measure of the two curiosity style dimensions; breadth and depth of interest, the pattern of relationships with the RIASEC themes should be focussed around the I-Theme. Grouped with it should be other themes which contain elements consistent with an orientation of approach to novelty whether it be novelty in the form of puzzling ideas, events, and mechanical phenomena, or novel sensations and experience. This leads to the following prediction:

The INVESTIGATIVE theme will be the most important of the general theme scales in describing that function which maximally separates the four curiosity style groups. In terms of the discriminant function analysis this means that the I-Theme will have the highest correlation with the first significant function.

Results

Discriminant function analyses (Hull & Nie, 1981) were used to determine that set of functions based on the general theme scale scores which provided the maximum discrimination between curiosity groups. As for the analysis based on the non-occupational indices of the CAI, four curiosity style groups were constructed by dividing the

distributions of scores on both breadth and depth dimensions at the median.

Appendix T contains the basic statistical information describing this analysis (Table T.1 - the overall means for the group of respondents on the general theme scales, Table T.2 - the means for each of the curiosity style groups on each of the RIASEC themes, Table T.3 - the univariate F ratios for each of the discriminating variables, Table T.4 - the canonical discriminant functions table, and Table T.5 - the standardized function coefficients for each of the discriminating variables).

The canonical discriminant functions table (Appendix T - Table T.4) indicated that there were two significant discriminant functions which accounted for 84.47, and 14.17 percent of the total variance respectively. The correlations between these two functions and the RIASEC theme variables are shown in Table 8.11 and indicate that all of the RIASEC themes had some correlation with the first function. As was indicated earlier the RIASEC themes are not independent.²

The largest of the correlations was that between Function 1 and the I-Theme (-.83). The R-Theme also had a high correlation (-.75) with Function 1. Hence, preferences and interests indicative of INVESTIGATIVE and REALISTIC personality types were most typical of the function. The centroids for each of the curiosity style groups on this function are shown in Table 8.12 and indicate that this function discriminated clearly between all four.

² Appendix T, Table T.6 shows the size of the correlations between the theme areas found in this group of respondents.

Table 8.11
Discriminant Function Analysis: Correlations^a
Curiosity Style by RIASEC Themes

Theme	Function 1	Function 2
R-Theme	-.75	.46
I-Theme	-.83	-.46
A-Theme	-.44	-.11
S-Theme	-.29	-.12
E-Theme	-.40	.03
C-Theme	-.18	-.49

^aPooled within-groups correlations between canonical discriminant functions and discriminating variables.

Table 8.12
Group Centroids
Curiosity Style by RIASEC Themes

Group Breadth/Depth	Function 1	Function 2
LOW/LOW	.91	-.09
LOW/HIGH	-.35	-.42
HIGH/LOW	.20	.35
HIGH/HIGH	-.79	.12

Function 2 which accounted for only 14.17 percent of the variance, did not spread the curiosity groups as widely as did Function 1. Rather, it appears to have discriminated between the high breadth/low depth group and the low breadth/high depth group. The centroids for these two extreme groups were approximately three-quarters of a standard deviation apart, while the other two group centroids were both close to the function mean. Three of the RIASEC themes have correlations between .4 and .5 with this function: C-Theme -.49, I-Theme -.46, and R-Theme .46. This function is therefore a CONVENTIONAL and INVESTIGATIVE versus REALISTIC dimension.

General Themes and Basic Interests. Johansson (1982) suggests that the general theme scales of the CAI represent a broad general overview of an individual's interests. Particular features or finer detail of the nature of these general themes can be examined through the Basic Interest Scales of the CAI. The latter are claimed to provide a breakdown of the more general theme scales into more "pure" interest domains. Each of the general theme areas can be subdivided into a number of basic interests. The R-Theme is further divided into: Mechanical/Fixing, Electronics, Carpentry, Manual/Skilled Trades, Agriculture, Nature/Outdoors, and Animal Service. The I-Theme is subdivided into: Science, and Numbers. The A-Theme is divided into: Writing, Performing/Entertaining, and Arts/Crafts. The S-Theme is divided into: Social Service, Teaching, Child Care, Medical Service, and Religious Activities. The E-Theme is subdivided into: Business, and Sales; and the C-Theme into: Office Practices, Clerical/Clerking, and Food Service.

Further discriminant analyses were performed using these Basic Interest Scales to determine more clearly the substantive nature of the functions which were shown in the previous analysis to be discriminating between the four curiosity style groups.

In the construction of the CAI many of the items have been used for more than one index. By way of illustration, the item "Read popular mechanics magazines" is scored as an item of the Fine Arts-Mechanical scale, one of the non-occupational indices. It is also one of the items scored for the R-Theme scale of the general theme scales, and appears again on the Mechanical/Fixing scale of the basic interest scales. Inspection of the items of the general theme scales and the basic interest scales indicates that the relationship between them is very much in the nature of a part-total correlation. Of the 20 items which go to make up the I-Theme scale 10 of them also appear within the 11 items of the Science basic interest scale. Eight of the 15 Mechanical/Fixing basic interest scale items are also in the 20 R-Theme items. Hence an analysis of those basic interest scales which correlate with the functions which separate the curiosity groups will provide some insight into the substantive nature of those functions both at the general theme, and the basic interest levels.

Although the sets of items involved in these two analyses (General Theme Scales and Basic Interest Scales) have a considerable degree of overlap, they are not identical and so some minor differences in the functions generated by the two separate analyses would be expected. However, the extent of overlap between the sets of items suggests that similarities will predominate.

Appendix U contains the summary statistics relevant to the discriminant function analysis relating the four curiosity groups to the basic interest variables. The canonical discriminant functions table (see Appendix U, Table U.4) indicated that there were two significant functions which discriminated between the curiosity groups and these functions accounted for 72.14 and 23.63 percent of the variance respectively (the corresponding percentages for the general theme scale analysis were 84.47 and 14.47).

Table 8.13 presents the correlations between the discriminant functions and the discriminating variables (the 22 basic interest scales) and shows that there were six basic interest areas which had correlations greater than .49 with Function 1. In order of magnitude these were Science (08: $r = -.67$), Electronics (02: $r = -.61$), Mechanical/Fixing (01: $r = -.55$), Numbers (09: $r = -.55$), Nature/Outdoors (06: $r = -.52$), and Agriculture (05: $r = -.51$). Only one of the basic interest scales had a correlation greater than .49 with Function 2: Agriculture ($r = .57$). The only other correlations of any note were those for Numbers ($-.45$) and Manual/Skilled Trades (.42).

The discriminant function analysis which used the general theme scales as the discriminating variables showed that only three of the general theme scales were strongly correlated with the two resulting functions. The analysis which used the basic interest scales as the discriminating variables showed the strongest function/variable correlations for basic interest areas which are designated components of those three general themes. Table 8.14 summarizes the correlations between the three general themes and their associated basic interest scales. The correlations presented there generally show a strong

Table 8.13
Correlations^a:
Curiosity Style by Basic Interest Scales

Basic Interest Scale	Function 1 ^b	Function 2 ^b
Mechanical/Fixing	-.55	.26
Electronics	-.61	.08
Carpentry	-.43	.30
Manual/Skilled Trades	-.44	.42
Agriculture	-.51	.57
Nature/Outdoors	-.52	.25
Animal Service	-.25	.19
Science	-.67	-.14
Numbers	-.55	-.45
Writing	-.34	-.11
Performing/Entertaining	-.31	.01
Arts/Crafts	-.31	-.04
Social Service	-.31	.03
Teaching	-.19	-.03
Child Care	-.05	-.15
Medical Service	-.25	-.21
Religious Activities	-.28	-.05
Business	-.30	-.02
Sales	-.17	.02
Office Practices	-.10	-.34
Clerical/Clerking	-.18	-.23
Food Service	.06	.11

^a Pooled within-groups correlations between canonical discriminant functions and discriminating variables.

^b Values >.49 have been entered in bold type.

association between the basic interest scales and their related general theme scale. It is also clear from Table 8.10 that some of the basic interest scales have important links with other than their designated theme scales. Nature/Outdoors, Agriculture, Electronics and even Mechanical/Fixing scales had sizeable correlations with the I-Theme.

Table 8.14
Correlations:
R, I, and C-Themes and Associated Basic Interest Scales^a

Basic Interest Scale	R-Theme	I-Theme	C-Theme
R-Theme Scales:			
Mechanical/Fixing	88	35	05
Electronics	79	43	01
Carpentry	85	29	12
Manual/Skilled Trades	75	25	21
Agriculture	74	44	09
Nature/Outdoors	51	53	17
Animal Service	30	25	17
I-Theme Scales:			
Science	39	94	07
Numbers	28	69	57
C-Theme Scales:			
Office Practices	-03	12	90
Clerical/Clerking	21	16	84
Food Service	-01	-04	36

Note. Decimal points omitted.

^aCorrelations for the Basic Interest Scales associated with each General Theme have been entered in **bold type**.

Interpreting Function 1

Examination of some of the common features of the six basic interest areas which had the strongest correlations with Function 1 can provide an indication of the likely nature of this function.

One of the strong common threads running through the descriptions of these six basic interest areas given by Johansson (1982, pp. 71 -

73) is that of a positive orientation towards understanding something of the "how" and "why" of the activity specified in the item content.

The highest correlations with the discriminant function were for the Science and Electronics areas. When describing the nature of the Science interest area Johansson reported that "high scorers describe themselves as clear-thinking, analytical, and scientifically oriented" (1982, p. 73). And, for the Electronics interest area: "scores on this scale are positively related to self-descriptions that indicate an analytical nature, such as being logical, scientific, resourceful, and clear-thinking" (p. 72). Consideration of the content of these two scales seems to indicate that they involve a similar general orientation, but one which has different manifestations. The content of the Science items is investigative ("Read books on science", "Study astronomy", and "Be a biologist"); the content of the Electronics items realistic in the sense of applying the understanding to solve practical problems ("Fix a broken radio", "Study electronics", and "Be an electrician").

Similar comments apply to item content in the other four basic interest areas which had substantial correlations with Function 1. Mechanical/Fixing, measuring an individual's preference for "repairing, fixing and adjusting things" implies a similar orientation to that in the Electronics area but at a slightly less sophisticated level of content. The Numbers area, the other I-Theme scale, includes some items which have a basic analytical orientation (e.g., "Program a computer to solve problems") while others suggest a more mechanical or routine application of skills in their specific content (e.g., "Add numbers to get a total"). It is the analytical orientation towards

numbers expressed in some of the item content which seems to relate most closely to the other basic interest scales which are grouped together by strong association with Function 1. The other two basic interest areas Nature/Outdoors and Agriculture, are both within the R-Theme basic interest scales, and according to Johansson need to be considered together. Of the Agriculture scale it is commented:

Working outdoors, studying agriculture, planting trees, and preventing forest fires are activities reflected in this scale... A companion scale worthy of inspection is the Nature/Outdoors scale. For example, conservation officers, forest rangers and park rangers will have high scores on both scales, while nature enthusiasts typically will have high scores on just the Nature/Outdoors scale.

(Johansson, 1982, p. 71)

The coupling of these two basic interest scales suggests an orientation similar to that described with the Electronics, and Mechanical/Fixing interest areas but with a different type of content as its focus.

This examination of the descriptions of the basic interest scales together with a consideration of the nature of their item contents suggest that the function which over these two analyses has been shown to separate the four curiosity groups, consists of a general orientation towards investigating and/or understanding the "why" and "how" of the preferred activities. For the general theme scales the function involves a preference for INVESTIGATIVE and REALISTIC themes. For the basic interest scales the function is manifest in preferences for the type of interests expressed in the Science, Electronics, Mechanical/Fixing, Numbers, Nature/Outdoors, and Agriculture areas.

Table 8.15
Group Centroids
Curiosity Style by Basic Interest Scales

Group Breadth/Depth	Function 1	Function 2
LOW/LOW	.95	-.13
LOW/HIGH	-.40	-.66
HIGH/LOW	.32	.48
HIGH/HIGH	-.88	.24

As indicated by the group centroids presented in Table 8.15 the four curiosity style groups were widely spread around the mean of Function 1. There was a distance of almost two standard deviations between the centroid for the low breadth/low depth group on one side of the function mean, and the high breadth/high depth group on the other. The pattern suggests that Function 1 is discriminating between all four groups and not just the two extremes. The smallest distance between any two group centroids is a little over one half of a standard deviation in distance.

Exactly the same patterning of group centroids along the first function was obtained in the RIASEC themes analysis (see Table 8.12). This consistency of group position warrants the conclusion that the four curiosity style groups constitute different levels of that function represented by Function 1 in both of these analyses. As outlined earlier that function appears to represent a patterning of

interests which can be characterized as an analytical problem solving dimension: understanding the "how" and "why" of events and situations. The dimension is characterized by an approach which depends on, and values, achieving an understanding of the "how" and "why" of preferred activities.

On this function the particular combination of the two curiosity dimensions is important. Depth of interest curiosity, an orientation towards exploring and investigating new objects, events and ideas, was predicted to be related closely to the analytic style dimension represented by Function 1. Both of the high depth of interest groups had their centroid located on the highside of the function mean. High breadth and high depth together indicated a stronger tendency towards adopting an analytical problem solving approach to preferred activities than did high depth combined with low breadth of interest curiosity.

The positioning of these groups on this function suggests that the particular combination of the two curiosity dimensions alters the nature of the "approach" behaviour represented by the breadth of interest curiosity dimension. It suggests that approach to the type of novel experience represented by the breadth of interest curiosity scale, is likely to have a stronger analytical flavour if the person also has a high score on the depth of interest curiosity dimension. When the high breadth score is coupled with low depth of interest curiosity, seeking varied and changing experiences is less likely to assume an analytical, investigative quality.

Interpreting Function 2

In the general theme scale analysis, Function 2 accounted for 14.17 percent of the variance, and in the basic interest scale analysis 23.63 percent. The largest correlations (see Table 8.11) with the general theme scales were with C-Theme (-.49), R-Theme (.46), and I-Theme (-.46). None of these correlations were as high as were the highest correlations between Function 1 and the discriminating variables. Similarly, the second function yielded by the basic interest area analysis did not have any very high correlations with the discriminating variables. The highest correlations were with Agriculture (.57), Numbers (-.45), and Manual/Skilled Trades (.42), and then the low value of -.34 for Office Practices (Table 8.13). This second function, accounting as it did for much less of the total variance than did Function 1, appeared much less stable across the two analyses.

The general theme scales' pattern of correlations defined the second function in terms of INVESTIGATIVE and CONVENTIONAL themes versus REALISTIC themes. The group centroids (Table 8.12) indicated that this function had two of the curiosity style groups located close to the function mean (high breadth/high depth: .12, and low breadth/low depth: -.01). The main separation on this function was between the two extreme groups: low breadth/high depth at -.42, the I-Theme and C-Theme end of the dimension; and high breadth/low depth at .35, the R-Theme end of the dimension.

The centroids for the curiosity style groups produced from the basic interest areas analysis (Table 8.15) showed an almost identical

pattern of separation around the function mean, the main difference being that the distance between the group centroids was slightly larger.

The most prominent of the correlations between Function 2 and the basic interest areas were: Agriculture (.57), Numbers (-.45), Manual/Skilled Trades (.42) and Office Practices (-.34). These scales occur within the three general theme areas which had strongest correlations with that analysis' Function 2. Inspection of the pattern of these correlations indicates their consistency with the corresponding pattern of general themes: R-Theme (Agriculture and Manual/Skilled Trades), versus I-Theme (Numbers) and C-Theme (Office Practices).

The dimension represented by Function 2, although having some of the general theme scales in common with Function 1, appears to derive from different elements within those themes. The Agriculture scale linked with Manual/Skilled Trades suggests an outdoor, and physically active pattern of interests, which is combined with a dislike for the indoor, and physically inactive routines typical of the interests represented by the Numbers and Office Practices scales.

For both analyses the correlations between Function 2 and the discriminating variables were considerably smaller than was the case with Function 1. Therefore, the content of those scales correlating with Function 2 does not provide as accurate a picture of the nature of the function as was possible with Function 1. Despite this qualification it would appear that Function 2 consists of a dimension characterized by interest in physically active occupations: the difference between the activities of farmer and plumber on the one

hand, and accountant and stenographer on the other.

Function 2 spreads the two mixed curiosity style groups. The high breadth/low depth group centroid was towards the physically active side of the function mean, the low breadth/high depth group towards the physically inactive side. This differentiation parallels the emphasis in a number of the items of the breadth of interest scale where the "varied and changing" activities stress physical activity. As was argued in the interpretation of Function 1, the coupling of high breadth and high depth of interest curiosity styles appears to give to those same physical activities a dimension of wanting to understand something about the nature of the activity, as well as to know in the sense of having experienced something new.

In summary, discriminant function analyses using the general theme scales and the basic interest scales of the CAI, indicated that there were two significant functions which separated the four curiosity style groups. The nature of the two functions produced by the separate analyses showed strong similarities as would be expected from the considerable overlap between the item sets which go to make up the scales of the general theme and basic interest areas of the CAI. Examination of the particular basic interest areas which grouped on these functions has allowed considerable insight into the substantive nature of those functions. Function 1 can be represented as an analytical problem solving dimension which emphasizes logical, resourceful, and clear-thinking approaches to new situations and activities; Function 2 a dimension of interest in physically active occupations. The four curiosity style groups represent different combinations of these two dimensions in their characterization of the

individual's response to novel situations and experience.

Rotating the Two Functions

As was the case with the analysis of the non-occupational indices of the CAI, the pattern of correlations between the RIASEC themes and the two significant discriminant functions was very similar to that of a principal components analysis. Hence, it was decided to rotate these first two functions to a varimax solution to see if that solution aided interpretation of the nature of the relationship between the RIASEC themes and the curiosity style groups. Table 8.16 presents the correlations between the RIASEC themes and the rotated functions and Table 8.17 the group centroids on those rotated functions. The relationship between the axes of the discriminant functions and the rotated functions are presented in Figure 8.2.

Inspection of Table 8.16 and Figure 8.2 indicates that rotated Function 1 consisted of a REALISTIC-INVESTIGATIVE function and rotated Function 2 an INVESTIGATIVE-CONVENTIONAL function. Rotation of the two significant functions which resulted from the basic interest scale analysis produced the same two functions: REALISTIC-INVESTIGATIVE and INVESTIGATIVE-CONVENTIONAL. The pattern of correlations presented in Table 8.18 revealed that the highest correlations with rotated Function 1 were for the R-Theme basic interest scales and the Science scale from the I-Theme scales. Rotated Function 2 grouped the I-Theme scales and Office Practices and Clerical/Clerking from the C-Theme basic interest scales.

Table 8.16
Discriminant Function Analysis: Correlations after Rotation^a
Curiosity Style by RIASEC Themes

Theme	Rotated Function 1	Rotated Function 2
R-Theme	.87	-.10
I-Theme	.56	.77
A-Theme	.35	.28
S-Theme	.21	.26
E-Theme	.38	.15
C-Theme	-.05	.52

^aCorrelations between rotated canonical discriminant functions and discriminating variables.

Table 8.17
Group Centroids (after Rotation)
Curiosity Style by RIASEC Themes

Group Breadth/Depth	Rotated Function 1	Rotated Function 2
LOW/LOW	-.86	-.31
LOW/HIGH	.14	.53
HIGH/LOW	-.03	-.40
HIGH/HIGH	.76	.23

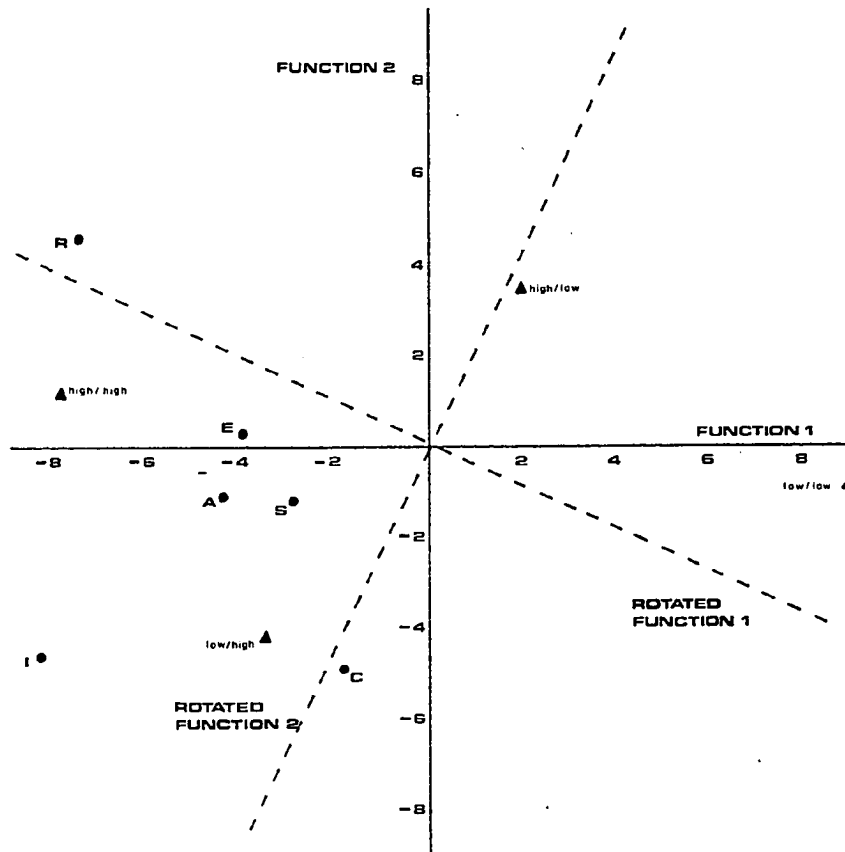


Figure 8.2 Rotated and unrotated axes:
Curiosity style by RIASEC themes

Table 8.18
Correlations after Rotation^a:
Curiosity Style by Basic Interest Scales

Basic Interest Scale	Rotated Function ^b	
	1	2
Mechanical/Fixing	.61	.06
Electronics	.56	.24
Carpentry	.52	-.04
Manual/Skilled Trades	.60	-.14
Agriculture	.73	-.23
Nature/Outdoors	.58	.05
Animal Service	.31	-.04
Science	.50	.46
Numbers	.24	.66
Writing	.23	.27
Performing/Entertaining	.28	.15
Arts/Crafts	.25	.20
Social Service	.28	.14
Teaching	.15	.12
Child Care	-.03	.16
Medical Service	.11	.31
Religious Activities	.22	.19
Business	.25	.17
Sales	.15	.07
Office Practices	-.09	.34
Clerical/Clerking	.04	.29
Food Service	.00	-.13

^aCorrelations between rotated canonical discriminant functions and discriminating variables.

^bValues >.49 have been entered in **bold type**.

The REALISTIC-INVESTIGATIVE function primarily discriminated between two of the four curiosity style combinations. For the general theme analysis shown in Table 8.17 the high breadth/high depth group centroid was well above the function mean while that for the low breadth/low depth group was well below the function mean. The

centroids for the other two groups were close to the function mean. The group centroids from the basic interest scale analysis (see Table 8.19) reflected exactly the same pattern of separation around the function mean.

Table 8.19
Group Centroids (after Rotation)
Cusiosity Style by Basic Interest Scales

Group Breadth/Depth	Rotated Function	
	1	2
LOW/LOW	-.88	-.37
LOW/HIGH	.01	.77
HIGH/LOW	-.03	-.58
HIGH/HIGH	.88	.24

The INVESTIGATIVE-CONVENTIONAL function discriminated between the groups differing on levels of depth of interest curiosity. The high depth of interest curiosity groups' centroids were both located above the function mean while those for the low depth of interest curiosity groups were below the function mean. Within this discrimination between high and low depth of interest curiosity groups breadth of interest curiosity appears to have exerted something of a suppressor effect. Of the high depth of interest curiosity groups the high breadth/high depth group centroid was located closer to the function mean than was that for the low breadth/high depth group. Similarly on

the other side of the function mean the high breadth/low depth group centroid was located further away from that mean than was the centroid for the low breadth/low depth group.

It was argued in the introduction to this analysis of the relationship between the general theme scales of the CAI and the curiosity style groups, that the INVESTIGATIVE theme would be the most important of those scale in distinguishing between the curiosity style groups. The discriminant functions described in these rotated solutions have pointed to two I-Theme patterns which discriminated between the curiosity style groups in different ways: REALISTIC-INVESTIGATIVE interests as represented in rotated Function 1, and INVESTIGATIVE-CONVENTIONAL as represented in rotated Function 2. The REALISTIC-INVESTIGATIVE pattern grouped those aspects of the I-Theme consistent with the Science basic interest scale together with the R-Theme and primarily distinguished between high breadth/high depth and low breadth/low depth curiosity style groups. The INVESTIGATIVE-CONVENTIONAL pattern although correlating with both I-Theme basic interest scales, was more closely related to the Numbers than to the Science interests. This aspect of the INVESTIGATIVE theme, closely associated with the CONVENTIONAL theme and basic interest scales, discriminated between the curiosity style groups in terms of both depth of interest and breadth of interest dimensions.

Occupational Interests, Curiosity Style and Sex Groupings

In the construction and development of the CAI, attempts were made to ensure that the item content was applicable to both females

and males, but, as Johansson (1982) points out, sex differences in responses still occur. The norming data reported by Johansson indicates "females and males differed by almost a full standard deviation on the Realistic scale, by about one-half standard deviation on the Artistic, Social, and Conventional scales, and minimally on the Investigative and Enterprising scales" (Johansson, 1982, p. 41). Naylor (1984) reports finding significant sex differences in expressed interest in the responses from two different school system groups. In the government school data there was evidence of the males expressing greater interest in Realistic and Enterprising themes, and the females more interest in the Social and Artistic theme areas. For the non-government school data there were significant differences over all the themes with males expressing more interest in Realistic, Enterprising, and Investigative areas, and females more interest in the others; Social, Artistic and Conventional.

The existence of such sex differences, together with the greater number of males in the present sample, require further analyses to test the generality of the discriminant functions reported above within groups homogeneous for gender. The mean scores for female and male groups on the general theme scales are tabulated in Appendix V (see Table V.1) and clearly indicate strong sex differences on all the themes except the E-Theme. The male group had higher scores on the Realistic and Investigative themes, the female group on the Artistic, Social and Conventional.

Discriminant function analyses were applied to the responses of the females and males separately. The summary statistics from the separate analyses of the female and male responses are presented in

Appendix V. As with the analysis for the total group responses, two analyses were performed: the first used the general theme scale scores as the discriminating variables, the second the basic interest scale scores.

Females. The results for the female analyses indicated that two functions warranted further exploration. The general theme analysis (Appendix V, Table V.3) yielded functions accounting for 87.62 and 10.09 percent of the total variance (the second of these functions had a significance level of .057 which might be regarded as borderline), while the analysis using the basic interest scales as discriminating variables (Appendix V, Table V.6) showed significant functions accounting for 74.11 and 17.76 percent of the variance.

The general character of the first function discriminating the four curiosity groups was very similar to that found in the total group analysis. The strongest correlations (Table 8.20) were with the INVESTIGATIVE (-.90) and REALISTIC (-.74) themes. As with the earlier analyses these two themes were the focus of the function, but in the female responses three of the other themes showed some correlation with Function 1: ARTISTIC -.48, SOCIAL -.50, and ENTERPRISING -.44. The group centroids (Table 8.21) were spread across the function in the same pattern as occurred for the total group: the high breadth/high depth group was at one extreme and the low breadth/low depth group at the other separated by almost two standard deviations distance. Again the low breadth/high depth group was on the same side of the function mean as the high breadth/high depth group, and there was an interval of approximately .6 of a standard deviation between each group centroid.

Table 8.20
 Discriminant Function Analysis: Correlations^a
 Curiosity Style by RIASEC Themes
 Females

Theme	Function 1	Function 2
R-Theme	-.74	.41
I-Theme	-.90	-.27
A-Theme	-.48	-.05
S-Theme	-.50	-.12
E-Theme	-.44	-.03
C-Theme	-.24	-.54

^aPooled within-groups correlations between canonical discriminant functions and discriminating variables.

Inspection of the table of correlations relating Function 1 and the basic interest scales (Table 8.22) indicated correlations greater than .50 for all of the six scales which had the highest correlations in the total group analysis: Science (-.73), Nature/Outdoors (-.67), Electronics (-.65), Agriculture (-.62), Mechanical/Fixing (-.52), and Numbers (-.51). An additional scale, one from the R-Theme area, appeared with these scales: Carpentry with a correlation of -.52. The pattern of correlations found over these different analyses is very consistent. The major difference in the set of correlations derived from the female responses, was the slightly larger size of the correlations for the basic interest areas representative of themes which were not a strong focus of that function. Basic interest areas

Table 8.21
Group Centroids
Curiosity Style by RIASEC Themes
Females

Group Breadth/Depth	Function 1	Function 2
LOW/LOW	.92	-.09
LOW/HIGH	-.34	-.37
HIGH/LOW	.32	.31
HIGH/HIGH	-.92	.12

which in the total group analysis had correlations around .3, in the female group analysis were more likely to be of the order of .4. For example, Social Service linked with the S-Theme had a correlation with Function 1 of -.31 in the total group analysis, and a correlation of -.48 in the female analysis; and, Performing/Entertaining from the A-Theme a correlation of -.31 for the total group, and -.44 for the female group.

This pattern for the female responses clearly indicates that the basic core of Function 1 is very similar to that observed for the whole group, but that the orientation towards activities which it represents pervades a very wide range of content. The additional content areas which showed an increased association with Function 1, were areas for which the females typically expressed stronger preferences than did the males in the group.

Table 8.22
Correlations^a:
Curiosity Style by Basic Interest Scales
Females

Basic Interest Scale	Function 1 ^b	Function 2 ^b
Mechanical/Fixing	-.52	-.08
Electronics	-.65	.03
Carpentry	-.52	-.12
Manual/Skilled Trades	-.38	-.11
Agriculture	-.62	-.35
Nature/Outdoors	-.67	-.18
Animal Service	-.36	-.21
Science	-.73	.09
Numbers	-.51	.51
Writing	-.30	-.01
Performing/Entertaining	-.44	.03
Arts/Crafts	-.36	-.03
Social Service	-.48	.03
Teaching	-.31	.02
Child Care	-.21	.20
Medical Service	-.34	.07
Religious Activities	-.40	.15
Business	-.38	.13
Sales	-.13	-.01
Office Practices	-.14	.24
Clerical/Clerking	-.23	.37
Food Service	-.16	.06

^apooled within-groups correlations between canonical discriminant functions and discriminating variables.

^bValues >.49 have been entered in **bold** type.

For both of the analyses using the set of female responses, the first function accounted for a very large percent of the variance: for the general theme scale analysis this was of the order of 88 percent, and the basic interest scale analysis 74 percent. The second function

Table 8.23
Group Centroids
Curiosity Style by Basic Interest Scales
Females

Group Breadth/Depth	Function 1	Function 2
LOW/LOW	1.06	.14
LOW/HIGH	-.35	.55
HIGH/LOW	.25	-.52
HIGH/HIGH	-.99	-.14

was then of correspondingly less significance in accounting for the differences between the curiosity style groups. The general themes associated with this function were the C-Theme (-.54) and the R-Theme (.41), which again were the highest correlations in the total group results, and showed the same direction of relationship. The highest positive correlations for basic interest scales with Function 2 were Numbers (.51), Clerical (.37) and Office Practices (.24), all expressing a liking for activities on the physically inactive end of the function, described for the total group as one of interest in physically active occupations. The highest negative correlation was for Agriculture (-.35).

The positioning of the group centroids around the function mean (Table 8.23) for Function 2 demonstrated a consistent ordering of the four curiosity groups across the two analyses. As would be expected

from the difference in the percentage of variance accounted for by the second function over the two analyses, the spread of the groups shown in the general themes analysis, was narrower than that for the basic interest scale analysis. However, the positioning and relative distances between the groups was consistent. The low breadth/high depth group was furthest from the function mean towards the physically inactive interests end of the dimension, next was the low breadth/low depth group with its centroid close to the function mean. On the other side of the function mean, and very close to it, was the high breadth/high depth group centroid, and then, furthest along the physically active interests end of the dimension was the high breadth/low depth group.

In short, analysis of the responses for the female group produced discriminant functions which were very similar to those found in the total group analysis. The main differences, slight as they were, between the patterns of results reflected the bias in expressed preferences which is typically found in female responses to vocational interest inventories: a higher value for Artistic, Social and Conventional themes (Naylor, 1984).

Males. There were two significant discriminant functions produced by both analyses of the male responses. The analysis based on the scores from the general theme scales yielded functions accounting for 76.36 and 21.56 percent of the total variance respectively (Appendix V, Table V.12). The basic interest scales analysis produced functions accounting for 66.31 and 29.11 percent of the total variance (Appendix V, Table V.16). Of particular note here is the relatively smaller proportion of the variance accounted for by the first function than

was the case in the female results, and the correspondingly greater percentage of the variance accounted for by the second function. This suggests that the second function is contributing more to the separation of the four curiosity groups than it did for the females.

The correlations between the discriminant functions and the discriminating variables for both of these analyses are presented in Tables 8.24 and 8.25.

Table 8.24
Discriminant Function Analysis: Correlations^a
Curiosity Style by RIASEC Themes
Males

Theme	Function 1	Function 2
R-Theme	-.68	-.16
I-Theme	-.76	.47
A-Theme	-.52	-.13
S-Theme	-.49	-.45
E-Theme	-.35	-.29
C-Theme	-.24	.29

^aPooled within-groups correlations between canonical discriminant functions and discriminating variables.

The general theme scales which had strong correlations with Function 1 were, as with the previous analyses, INVESTIGATIVE (-.76), and REALISTIC (-.68). Other supporting themes were ARTISTIC (-.52) and

Table 8.25
 Discriminant Function Analysis: Correlations^a:
 Curiosity Style by Basic Interest Scales
 Males

Basic Interest Scale	Function 1 ^b	Function 2 ^b
Mechanical/Fixing	-.48	.16
Electronics	-.55	-.06
Carpentry	-.27	.19
Manual/Skilled Trades	-.27	.28
Agriculture	-.35	.65
Nature/Outdoors	-.38	.48
Animal Service	-.27	.35
Science	-.62	-.07
Numbers	-.50	-.38
Writing	-.36	.07
Performing/Entertaining	-.29	.51
Arts/Crafts	-.47	.23
Social Service	-.39	.44
Teaching	-.25	.27
Child Care	-.21	.28
Medical Service	-.32	.21
Religious Activities	-.27	.17
Business	-.23	.15
Sales	-.08	.18
Office Practices	-.21	-.15
Clerical/Clerking	-.20	-.10
Food Service	.06	.37

^aPooled within-groups correlations between canonical discriminant functions and discriminating variables.

^bValues >.49 have been entered in **bold** type.

SOCIAL (-.49). Of the basic interest scales only three had correlations beyond .50, and these were Science (-.62), Electronics (-.55), Numbers (-.50), Mechanical/Fixing (-.48), and Arts/Crafts (-.47). Close to these but not quite as large were the correlations for Social Service (-.39), Nature/Outdoors (-.38), Writing (-.36) and

Agriculture (-.35). The size of these smaller correlations suggests that within the scales they represent there are items which have a flavour consistent with the nature of Function 1, as well as a number of items of a different character. For example, the Social Service scale includes items such as "Work with a group on a project", "Help someone solve personal problems", and "Organize a group or club", items which indicate the Function 1 approach to analytical problem solving; together with items such as "Be a guide for visitors", "Be a recreation leader", and "Meet new people", which are not at all Function 1 type items. The content of scales such as the Social Service, and the Writing basic interest scales accounts for the association of the A-Theme and S-Theme scales with the more central I- and R-Themes on Function 1. Consideration of the pattern of correlations between the basic interest scales and the general theme scales also supports this interpretation. Table 8.26 sets out the size of the correlations between each of the basic interest scales and the general theme scales which correlated with Function 1. The A-Theme basic interest scales which had noteworthy correlations with Function 1, were Arts/Crafts and Writing. As Table 8.26 indicates these scales also had moderate associations with the other general theme scales: Arts/Crafts with R-Theme, I-Theme and S-Theme; Writing with I-Theme and S-Theme.

Tables 8.27 and 8.28 outline the pattern of group centroids obtained from the analysis of the male scores, and, as has been the consistent pattern throughout all of these analyses, Function 1 separated the four curiosity groups around the function mean. The degree of separation between the extreme groups on this function was not quite as wide as was the case for the female group, but there was

Table 8.26
Correlations:
R, I, A, and S-Themes and Associated Basic Interest Scales^a
Males

	R-Theme	I-Theme	A-Theme	S-Theme
R-Theme:				
Mechanical/Fixing	86	19	02	01
Electronics	72	30	-04	-03
Carpentry	81	08	10	15
Manual/Skilled Trades	68	06	12	25
Agriculture	66	29	25	38
Nature/Outdoors	49	50	39	48
Animal Service	35	30	30	37
I-Theme:				
Science	25	94	36	24
Numbers	14	69	26	25
A-Theme:				
Writing	-04	33	85	50
Performing/ Entertaining	19	24	78	65
Arts/Crafts	47	38	68	48
S-Theme:				
Social Service	26	29	53	94
Teaching	19	23	45	79
Child Care	15	19	49	84
Medical Service	24	49	36	59
Religious Activities	16	32	46	56

Note. Decimal points omitted.

^aThe correlations for the Basic Interest Scales associated with each General Theme have been entered in **bold** type.

still more than one and one half standard deviation units separating the extreme groups: high breadth/high depth, and low breadth/low depth. Again the low breadth/high depth group centroid was located on the same side of the function mean as the high breadth/high depth group.

Table 8.27
 Group Centroids
 Curiosity Style by RIASEC Themes
 Males

Group Breadth/Depth	Function 1	Function 2
LOW/LOW	.85	.19
LOW/HIGH	-.32	.34
HIGH/LOW	.20	-.55
HIGH/HIGH	-.73	-.03

Table 8.28
 Group Centroids
 Curiosity Style by Basic Interest Scales
 Males

Group Breadth/Depth	Function 1	Function 2
LOW/LOW	.85	-.31
LOW/HIGH	-.48	-.56
HIGH/LOW	.46	.63
HIGH/HIGH	-.79	.26

Function 2, which was a stronger function in the results of the analyses for the male group than in the other analyses, was correlated with INVESTIGATIVE (.47) and SOCIAL (-.45) themes. The basic interest scales which had the highest correlation with Function 2 were: Agriculture (.65), Performing/Entertaining (.51), Nature/Outdoors (.48) and Social Service (.43). This function appears to have a slightly different emphasis to the second function in the total group and female analyses. Agriculture and Nature/Outdoors are basic interest scales which are associated with the REALISTIC theme. As can be seen from Table 8.26 the Nature/Outdoors scale has as high a correlation with the I-Theme as it does with the R-Theme in this group of males. It also has a correlation of the same size with the S-Theme. The Performing/Entertaining scale also correlates highly with the S-Theme. Several other elements would also seem to be important in interpreting the nature of this function. The I-Theme basic interest scales correlations with Function 2 suggest that it is the physically inactive, computational interests which are associated with this function: Numbers had a correlation of $-.38$, and Science a correlation of $-.07$. Hence, the function appears to combine computational interests with preferences away from the outdoor, social interests represented by the Agriculture and Performing/Entertaining grouping. The function therefore, has elements in common with the physical activity/inactivity dimension which was evident in the female responses, combined with a strong "doing things with people" emphasis.

The group centroids on this function (see Tables 8.27 and 8.28) had the high breadth/low depth group indicating the strongest preferences for the outdoor/social combination, and the low breadth/high depth group on that side of the function mean indicating a

preference away from such activities. Consistent with its larger proportion of variance, the group centroids were spread further across this function than for the second function of the other analyses. The high breadth/high depth group was approximately one quarter of a standard deviation away from the function mean towards the outdoor, social end of the dimension, and the low breadth/low depth group was approximately the same distance the other side of the function mean.

Rotating the function axes. Rotation of the first two function axes for the total set of responses to a varimax criterion produced two separate INVESTIGATIVE theme functions: REALISTIC-INVESTIGATIVE and INVESTIGATIVE-CONVENTIONAL. The same pattern was observed when the first two functions for the female group were rotated (see Appendix V, Tables V.18 and V.19). However, there were some important differences in the size of the correlations between the general themes and the rotated functions to that found for the total group.

For the total group the REALISTIC theme had the highest correlation with Function 1 (.87) and the INVESTIGATIVE theme a correlation of .56. For the female group the correlations between these two themes and rotated Function 1 were almost equal (R-Theme .82 and I-Theme .80). Rotated Function 2 for the total group had its highest correlation with the INVESTIGATIVE theme (.77) and this was coupled with a correlation of .52 for the CONVENTIONAL theme. The female group results yielded correlations of .59 for the C-Theme and .50 for the I-Theme with rotated Function 2.

The REALISTIC-INVESTIGATIVE function in the total group analysis

distinguished mainly between the high breadth/high depth and low breadth/low depth curiosity style groups. The centroids for the other two groups were located very close to the function mean. The REALISTIC-INVESTIGATIVE function in the analysis for the female group demonstrated the same ordering of the group centroids but indicated more separation between the two groups located close to the function mean. This difference in positioning of the centroids suggests that for the females the REALISTIC-INVESTIGATIVE function was more closely related to the depth of interest curiosity dimension than was the case for the total group.

The correlations between the general themes and the rotated functions for the male group yielded a slightly different pattern of relationships to that of the female group (see Appendix V, Tables V.20 and V.21). Rotated Function 1 grouped the SOCIAL (.67) and REALISTIC (.61) themes while rotated Function 2 was primarily an INVESTIGATIVE theme function (.85). The second highest correlation with rotated Function 2 was that for the C-Theme but this correlation was only .38 and so of less importance in describing the substantive nature of that function. The pattern of group centroids on both of these functions indicated rotated Function 1 as a breadth of interest curiosity dimension and rotated Function 2 as a depth of interest curiosity dimension.

These differences in the nature of the functions discriminating between the curiosity style groups for the females and the males are consistent with the differences in patterning of interests generally observed between female and male responses to occupational interest inventories.

Summary

Despite the significant differences in the scores of the males and females on the general theme scales of the CAI, there were very strong similarities between the results produced by the two sets of data. In both cases the four curiosity groups were significantly discriminated by a function based around the INVESTIGATIVE and REALISTIC themes. Subsidiary emphases within the character of this function showed up the typical patterns of differences in the expressed preferences of the two sex groups, but the central elements were the same. Examination of the basic interest scales which made up the general theme areas, and the pattern of relationships that those finer grain scales had with the function, suggested that Function 1 could be represented as an analytical problem solving dimension; one which emphasizes logical, resourceful and clear-thinking approaches to new situations and activities.

There were several important differences between the second functions produced by the two different groups' results. Firstly, the second function in the results for the female group scores did not account for a very large proportion of the variance and is therefore only of minor significance in characterizing differences between the curiosity style groups. Also a significant feature of the second function for the male group was the involvement of basic interest scales which indicated a SOCIAL quality in that function.

Rotation of the function axes indicated that there were two

INVESTIGATIVE patterns which discriminated between the curiosity style groups in different ways. Similar rotations for the female and male responses separately highlighted some different emphases within the discriminant functions related to sex of the respondent.

Discussion and Conclusions

The most striking feature of the results of all these analyses was the consistency of the character of the linear discriminant function which maximally separated the curiosity style groups. In each case this function accounted for a very large percentage of the variance, the percentage being higher in the female group analyses than it was in the corresponding analyses for the male group. In one instance, the non-occupational indices analysis for the female group, this was as high as 96 percent. The male group analysis for the basic interest scale showed the lowest percent of variance for the first function at 66 percent, but most of the values were in excess of 75 percent. Clearly there is a very close relationship between the curiosity style variables and those measured by the various indices of the CAI.

An important aspect of the consistency of the largest of the linear discriminant functions over all the analyses was the positioning of the four curiosity style groups' centroids around the function mean. In every case the groups were spread at relatively equal intervals along the function, two groups on either side of the function mean. The order was always the same: high breadth/high depth, low breadth/high depth, on one side of the function mean; and high

breadth/low depth on the other side, with low breadth/low depth at the other extreme. The distance along the function between the extreme groups was always greater than one and one half standard deviation units, and often as much as two standard deviation units. The distance between the group centroids and the consistency of their ordering along this function indicated that the patterning of the curiosity style variables was important. The breadth and depth of interest curiosity styles are separate dimensions but the way in which they were combined in any individual case was critical in terms of positioning along Function 1.

The largest correlations between the discriminating variables and the function in the CAI non-occupational indices analyses were consistently those for the Educational Orientation scale and the Variability of Interests scale. Consideration of the style and content of these scales suggested that the function linking them consisted of preferences towards activities which lead to an increased awareness and understanding of events, ideas and natural phenomena. At one pole of the dimension this style of approach embraced a wide and varied range of activities. At the other pole there was a rejection of variety.

A very similar picture emerged from the analysis of the substantive nature of the main function from the general themes and basic interest scales, which discriminated between the curiosity style groups. In the three analyses using the general theme scales as the discriminating variables the focus of the main function was the Investigative and Realistic themes. These themes are adjacent themes on the hexagonal model proposed by Holland (1973). In the analyses

using the basic interest scales the nature of the link between these theme areas was elaborated through a consideration of those scales which correlated strongly with the function. Again there was a reasonably high level of consistency between the analyses for the male and female groups and that for the total group. Six of the basic areas appeared to mark out the content of the function: Science, Electronics, Mechanical/Fixing, Numbers, Nature/Outdoors, and Agriculture. As has been elaborated in detail above the content of the items on these scales suggests that the function consisted of a general orientation towards investigating and/or understanding the "why" and "how" of the preferred activities. It can be represented as a type of analytical problem solving dimension which emphasises logical, resourceful, and clear-thinking approaches to new situations, activities, and problems. This orientation to activities was represented in preferences for occupations as diverse as Biologist and Mechanic. It represents a way of approaching problems and activities rather than being a liking for particular areas of content.

For most of the analyses there was a second significant discriminant function. The small percentage of variance accounted for by this function suggested that it was of relatively minor significance for distinguishing the curiosity style groups. The character of this function showed less consistency across the various analyses. In most cases the pattern of group centroids on that function indicated that it was discriminating between the high breadth/low depth and low breadth/high depth groups. However, as would be expected from the relatively low percentage of variance accounted for by this function the group centroids were not spread very widely around this function's mean.

Validity of the Two Factor Curiosity Scale

The arguments as to the nature of the main function which distinguished the curiosity style groups indicate the conclusion that the Two Factor Curiosity scale is a valid measure of curiosity. Examination of the relationships between the Two Factor Curiosity scale and the various indices of the CAI was conceived as a test of the construct validity of the scale. The CAI is a very widely used measure of motivational orientations as represented in occupational interests and preferences. It was suggested in the introductory comments to this chapter that if the Two Factor Curiosity was a valid measure of the motivational orientations of breadth and depth of interest curiosity, scores on that scale would relate in systematic ways to other measures (the CAI indices) which are attempting to classify similar motivational orientations.

The similarity between the main discriminant function which was shown to operate across all the analyses relating scores on the Two Factor Curiosity scale and the various CAI indices, and the orientations purportedly measured by the curiosity scale, points firmly to the conclusion that this measure of breadth and depth of interest dimensions has a high degree of construct validity.

CHAPTER 9

CURIOSITY AS AN AFFECTIVE-COGNITIVE STRUCTURE

Overview. In Chapter Four it was argued that Izard's differential emotions theory (Izard, 1977) presents a theory of motivation which is appropriate for an understanding of the nature of curiosity, and that it overcomes some of the difficulties associated with other major theories of curiosity.

The study reported in this chapter was designed to explore the patterns of fundamental emotions aroused in situations indicative of breadth of interest curiosity and depth of interest curiosity. Analysis of the patterns of emotion reported by the participants in the study suggested that the affective-cognitive structures operating in both curiosity dimensions are organized around arousal of the positive emotion interest-excitement. Enjoyment-joy and surprise-startle were also aroused but to a lesser extent. The pattern of emotions reported in situations indicative of breadth of interest curiosity also included the negative emotion fear-terror.

In the Chapter Four it was argued that Izard's differential emotions theory (Izard, 1971, 1972a, 1972b, 1977) provides an appropriate explanation of curiosity behaviour which overcomes some of the difficulties associated with other theories in this area. The critical element of his theory in this regard is his proposition that affective-cognitive structures or orientations are key motivational variables directing complex human behaviour.

Differential emotions theory proposes that the selectivity of complex human behaviour can best be explained in terms of the operation of affective-cognitive structures. Such structures are:

Trait-like phenomena that result from repeated interactions between a particular affect or pattern of

affects and a particular set or configuration of cognitions. *
 (Izard, 1977, p. 45)

Within this system curiosity is viewed as the outcome of the operation of an affective-cognitive structure based around the emotion interest-excitement. It is through the arousal of interest-excitement, and the other emotions which with it go to make up the particular affective-cognitive structure, that the information properties of the stimulus instigate and direct approach to novelty.

When describing affective-cognitive structures Izard (1977) makes reference to two forms of curiosity which closely parallel the breadth of interest and depth of interest distinction. He speculates about the particular affective-cognitive structures which might be involved in what he refers to as sensation seeking and intellectual curiosity.

The descriptive term affective-cognitive orientation seems a particularly useful way of conceptualizing certain personality traits. For example, the interest-fear combination may be frequently associated with cognitions about risking and escaping danger for fun and thrills and result in the affective-cognitive orientation (or trait) of sensation seeking. However, the interest-fear combination may be associated with the risk-taking involved in exploration for the sake of discovery, and in this case the affective-cognitive orientation could be intellectual curiosity.
 (Izard, 1977, p. 50)

Sensation seeking or breadth of interest curiosity, is suggested to be based on an interest-fear pattern of emotions. This pattern has become linked with a certain set of cognitions. The relevant set is that involving events, activities, and situations which for the individual concerned, are perceived as representing change and variation.

Intellectual curiosity, or depth of interest curiosity, is suggested by Izard to involve an interest-fear pattern of emotions. In this case the relevant set of cognitions is that group perceived as representing new problems, puzzling ideas or phenomena. Although it may be possible to consider approach to this type of activity as representing some cognitive risk, these situations do not have the same danger, or implied threat, as is often associated with the situations representative of seeking variation and change. This being the case, the pattern of emotions which are involved in the affective-cognitive structure of depth of interest curiosity is less likely to consist of an interest-fear combination than is the breadth of interest pattern.

The particular pattern of emotions associated with interest-excitement in both breadth of interest and depth of interest curiosity is thus an empirical question and one which the study reported in this chapter was designed to explore. Participants in the study were presented with four statements each describing a situation chosen to represent either breadth of interest or depth of interest curiosity (hereafter referred to as situation-type), at either a high or low intensity level. They were required to report the emotions which they expected to experience in each of the situations presented by completing a differential emotions scale (DES).

The DES was developed by Izard (1971, 1972a, 1972b, 1977; Izard, Dougherty, Bloxom, & Kotsch, 1974) as an instrument to measure the pattern of emotions aroused in a situation. Construction of the test was based on the assumption "that separate and discrete emotions exist

and that each has measurable experiential and motivational properties." (Izard, 1972a, p. 85; 1972b, p. 78). The scale consists of a set of emotion terms chosen to represent the fundamental emotions: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, disgust-revulsion, contempt-scorn, fear-terror, shame-humiliation (shyness), and shame-humiliation (guilt). Izard (1972a, 1972b; Izard et al., 1974) reports the results of a number of factor analytic studies which indicated a relatively stable factor structure underlying the DES items. The DES has been shown to be sufficiently sensitive to distinguish between an anxiety situation and others representing fear, guilt, and distress (Izard, 1972a, 1972b). It has also been used for situations recalled from the past as well as present situations. Bartlett and Izard (1972) required students to complete the DES for a series of recalled situations. The students were given the name of an emotion and then asked to recall and describe an event in their lives in which that emotion was strongly experienced. For each situation the DES showed a profile in which the target emotion items had the highest mean together with elevated means on the items for other related emotions. Items for unrelated emotions showed no elevation.

The present study was designed to investigate the following specific questions:

1. What patterns of emotions are aroused in situations representative of breadth of interest curiosity and depth of interest curiosity?
2. What similarities and differences are there between the patterns of emotions aroused in situations which represent different intensities of both breadth of interest and depth of interest curiosity?
3. Are there any differences in the patterns of emotions aroused in these situations which relate to

the individual's scores on the breadth of interest and depth of interest subscales of the Two Factor Curiosity Scale?

On the basis of Izard's theory and the analysis of breadth and depth of interest curiosity which has been developed in this thesis, two specific predictions were made:

1. In situations representing both breadth of interest curiosity and depth of interest curiosity the level of arousal reported for interest-excitement will be higher than for any of the other fundamental emotions.

2. The pattern of emotions in situations representing breadth of interest curiosity will have significantly higher levels of fear-terror reported than will those representing depth of interest curiosity.

Method

The participants in this study were 47 third year college students undertaking a one year course in Educational Psychology. There were 23 females and 24 males in the group and they had a median age of 21 years. Testing was conducted during two sessions one week apart. During session one, the Two Factor Curiosity Scale with its breadth of interest and depth of interest subscales (see Appendix I) was administered. Before session two the responses were scored and from each individual's responses four items were selected which for that person represented different curiosity-type and curiosity-intensity situations: high depth, low depth, high breadth, and low breadth of interest. The response range for each item in the Two Factor Curiosity Scale is 1 - 4 with a rating of 1 indicating a low level of curiosity and 4 a high level of curiosity. For each person participating in the testing, high depth and high breadth of interest items were randomly selected from those on the appropriate subscale

with the response category of 4 circled. If no item had been given a rating of 4, an item rated 3 was chosen. Low depth and breadth items were randomly selected from those with 1 circled. Again if there was no suitable item rated 1 an item marked 2 was selected.

During session two the students were presented with an envelope containing four individualized copies of the DES. Each test form had a different situation described in the instructions depending upon the specific item content which had been chosen to represent the four curiosity-type by curiosity-intensity situations for that student.

The form of the DES used in this study consisted of 33 items, three representing each of the 10 fundamental emotions and three items representing a fatigue factor (Izard, 1972b). A copy of the scale appears in Appendix W. The instructions asked for a rating on a five point scale of:

The extent to which each word describes the way you feel when (the specific situation was described, e.g., walking into an old deserted house at midnight).

The four DES forms were randomly ordered in each envelope and the students were instructed to take out one form at a time, complete it, turn it face down and proceed to the second, and so on until all the forms had been completed.

Summary of Design

Session 1: Administration of Two Factor Curiosity Scale

Session 2: Administration of individualized DES forms for four curiosity-type by curiosity-intensity situations.

Analyses

Three separate forms of analysis were used to investigate the similarities and differences between the patterns of emotions reported in each of the four curiosity-type by curiosity-intensity situations: factor analysis, emotion profiles, and multivariate analysis of variance.

Individual factor analyses of the DES responses from each of the four curiosity-type by curiosity-intensity situations were performed to identify the particular emotions and emotion combinations which were reported in each situation. In addition, the general structure of the DES was examined by summing the responses for each item of the scale across all four situations and then factor analyzing the combined item score.

Emotion profiles for the four curiosity-type by curiosity-intensity situations were drawn up to highlight the differences and similarities in the response levels for particular emotions. These situation differences were also considered in relation to the respondents' general trait levels of breadth of interest and depth of

interest curiosity. To do this a multivariate analysis of variance (MULTIVARIANCE, Finn, 1976) was performed with two between groups factors: breadth of interest curiosity trait (high or low) and depth of interest curiosity trait (high or low), and two repeated measures variables: type of curiosity situation (breadth or depth) and its intensity (high or low). The MANOVA design is illustrated in the sample classification table presented in Table 9.1.

Table 9.1
Classification Table for MANOVA Design

($N = 38$)^a

		Repeated measures variables (situation-type by -intensity)			
		1 (High Depth)	2 (Low Depth)	3 (High Breadth)	4 (Low Breadth)
Between groups factors (curiosity traits)		High depth by high breadth of interest traits ($n = 11$)			
		High depth by low breadth of interest traits ($n = 11$)			
		Low depth by high breadth of interest traits ($n = 8$)			
		Low depth by low breadth of interest traits ($n = 8$)			

^aSome of the data sets were incomplete.

Results

Factorial Analysis of DES Responses

Analysis of the DES responses (see Appendix P) for each of the four curiosity situations was performed using the SPSS method of principal factoring with iteration (Nie et al., 1975). Table 9.2 records the pattern of principal factors found in each set of data listing the number of factors with eigen values greater than one and their cumulative percent of variance.

Table 9.2
Factor Solution for DES in Four Situations:
Number of Factors by Cumulative Percent of Variance

Factors	Situations			
	DEPTH		BREADTH	
	High	Low	High	Low
1	33.9	31.6	25.0	34.6
2	49.3	47.8	38.8	47.8
3	59.1	58.0	47.4	56.8
4	64.8	63.5	55.5	64.7
5	70.0	68.2	62.0	70.2
6	74.4	72.7	67.6	74.3
7	78.4	76.7	71.9	78.1
8	81.7	80.1	75.9	
9			79.3	

It is clear from the data presented in Table 9.2 that the number of factors and the variance accounted for by those factors was almost identical for three of the situations: high depth, low depth, and low breadth. The first factor in the solution for the fourth (high breadth) situation accounted for a smaller percentage of the variance than was the case with the other three. Combined with the second factor this accounted for only a slightly larger percentage of the variance than did the first factor for the other three situations. The pattern of variance accounted for by later factors was then very similar to that seen across the other three situations.

Table 9.3 summarizes the factor structure found over the four situations listing the emotions which made up each rotated factor. In each case the number of items for a particular emotion having a relatively strong factor loading ($>.50$) have been included. (Appendices Q, R, S and T set out the individual items and the size of the factor loadings for all items with loadings $>.29$).

Inspection of Table 9.3 indicated that in a large number of cases the three items included in the DES to represent a particular emotion occurred on the same factor and had relatively high loadings on that factor. This information has been extracted and presented in Table 9.4. For each of the emotions measured on the DES there were three items. A score for each emotion was obtained by summing the ratings for the three critical items. Scores for the separate emotions therefore ranged from 3 to 15. Izard (1972a, 1977) suggests a level of 5.5 as the minimum score for any emotion to be considered operative in the emotion dynamics of a situation. All emotion groupings which scored a mean rating of 5.5 or more have that mean included in

Table 9.3
 Rotated Factor Structure of DES for Four Curiosity Situations:
 Number of Items for each Emotion with High Factor Loadings ($> .50$)

Factor	Situations			
	High Depth Curiosity	Low Depth Curiosity	High Breadth Curiosity	Low Breadth Curiosity
1	fear-terror 3 anger-rage 3 distress-anguish 3 disgust-revulsion 1	fear-terror 3 anger-rage 3 distress-anguish 2 disgust-revulsion (S) 2 shame-humiliation (S) 1 fatigue-sleep 1	- enjoyment-joy 3 anger-rage 2 distress-anguish 2 disgust-revulsion (G) 2 shame-humiliation (G) 2	anger-rage 3 contempt-scorn 3 disgust-revulsion 2 fatigue-sleep 2 distress-anguish 1
2	interest-excitement 3 enjoyment-joy 3 surprise-startle 2	interest-excitement 3 enjoyment-joy 3 surprise-startle 3	interest-excitement 3	interest-excitement 3 fear-terror 3
3	fatigue-sleep 3 contempt-scorn 3 shame-humiliation (G) 1 shame-humiliation (S) 1	contempt-scorn 2 shame-humiliation (S) 1 fatigue-sleep 1	shame-humiliation (G) 2 fatigue-sleep 2 contempt-scorn 1	enjoyment-joy 3
4	shame-humiliation (G) 3 fear-terror 2	fatigue-sleep 2	fear-terror 3	shame-humiliation (G) 2
5	disgust-revulsion 2 surprise-startle 3	disgust-revulsion 1 contempt-scorn 1	surprise-startle 3	surprise-startle 3
6	surprise-startle 3	disgust-revulsion 1	shame-humiliation (S) 3	shame-humiliation (S) 3
7	shame-humiliation (S) 2 fatigue-sleep 1	shame-humiliation (S) 1 contempt-scorn 1	contempt-scorn 2	disgust-revulsion 1
8	fatigue-sleep 1	shame-humiliation (G) 1	disgust-revulsion 1	disgust-revulsion 1
9			fatigue-sleep 1	

parentheses in Table 9.4.

The data presented in Table 9.4 indicate clearly that there was a stronger and more consistent factor structure over all four analyses for those emotions which had mean ratings exceeding Izard's suggested threshold level.

Referring back to Table 9.3, Factor 1 in all four analyses consisted of emotions "not at all" experienced in the curiosity situations. This factor was made up of items from a reasonably consistent group of emotions: anger-rage, distress-anguish, disgust-revulsion, and, for the two depth curiosity situations, fear-terror. Fear-terror was not included in this factor for either breadth curiosity situation. Some fatigue-sleep items were represented and also some contempt-scorn, but they did not occur on Factor 1 for all four analyses. A cross-check with Table 9.4 shows that in the main the emotions which appeared on Factor 1 had mean ratings below the suggested threshold of 5.5. Factor 1 appears to have been a grouping of those emotions which were not reported in the four curiosity-type by curiosity-intensity situations.

A significant exception to this general pattern was the negative loading of the three enjoyment-joy items on Factor 1 in the high breadth situation: "delighted" -.60, "happy" -.59, "joyful" -.50. A consideration of the mean rating for each of these items is of interest. The three enjoyment-joy items had a mean rating of 3.9 while the other 12 items on Factor 1 had a mean rating of 1.2.¹ For the high

¹ Note: The mean rating for each item ranges from 1.0 - 5.0; the mean rating for the emotion ranges from 3.0 to 15.0.

Table 9.4
Consistency of DES Items within Emotion Groupings
Across the Four Situations

Emotions	Situations			
	DEPTH		BREADTH	
	High	Low	High	Low
interest-excitement	* (11.2)	* (9.1)	* (12.7)	*(11.5)
enjoyment-joy	* (8.5)	* (5.6)	* (11.6)	* (5.9)
surprise-startle	* (7.7)	* (6.2)	* (8.5)	* (8.8)
fear-terror	*	*	* (6.9)	* (9.9)
anger-rage	*	*		*
distress-anguish				(5.5)
disgust-revulsion				(5.9)
contempt-scorn	*			*
shame-humiliation (shyness)			*	*
shame-humiliation (guilt)	*	*		
fatigue-sleep	*	*	(5.5)	

Note. The numbers in parentheses indicate the value of the mean rating for an emotion where that mean exceeds the 5.5 threshold suggested by Izard (1972a, 1977).

*All items loading >.49 on the same factor.

breadth curiosity situation negative loadings on enjoyment-joy items were grouped with positive loadings on anger-rage, distress-anguish and shame-humiliation (guilt) items. Experiencing enjoyment occurred together with the absence of anger, distress and guilt.

Factor 2 for each of the four analyses included all the interest-excitement items. For both depth curiosity situations interest-excitement grouped with enjoyment-joy and surprise-startle, while in the low breadth curiosity situation it grouped with the fear-terror

items. Factor 2 appears to be the critical factor in distinguishing the emotional quality of the curiosity situation. In each case all of the emotions present on factor 2 had mean ratings greater than 5.5.

The patterns of results for the two depth curiosity situations were very similar indicating that interest-excitement, enjoyment-joy and surprise-startle generally were reported together. Surprise-startle was less closely related to the other two emotions in the high depth curiosity situation than in the low depth curiosity situation. The factor loadings of the individual items in the high depth situation showed "amazed" and "astonished" to have loadings of .55 and .50 respectively, while all the other items on Factor 2 had loadings greater than .70. The three surprise-startle items also occurred together on a separate factor (F6). In the low depth situation the surprise-startle items had some of the highest loadings on Factor 2: "astonished" .86, "amazed" .78.

In the breadth curiosity situations interest-excitement, enjoyment-joy and surprise-startle appeared on separate factors. The mean ratings for each of these groupings indicated that these emotions were all reported in the breadth curiosity situations but in variable combination. The low breadth situation was distinctive in that fear-terror appeared with interest-excitement on Factor 2 and the factor loadings were all high (.71 to .78) except for the interest-excitement item "attentive" which had a loading of .50.

Factor 2 appears to have been the critical factor distinguishing the pattern of emotions reported in each of the four curiosity-type by curiosity-intensity situations.

The responses to the items of the DES were summed across the four curiosity situations and a factor analysis (Nie et al., 1975) performed on the combined scores. This produced a solution with seven factors having eigen values greater than one, and together these seven factors accounted for 80.3 percent of the total variance. Table 9.5 summarizes the rotated factor structure of the DES for the combined data. It lists for each factor the emotions which appeared on that factor and indicates the number of items with relatively strong factor loadings (>.50) for each emotion. Appendix U sets out the full table of individual items and the size of their factor loadings.

Table 9.5
Rotated Factor Structure of DES:
Combined Data

Factor	Emotion	No. of Items ^a	Percent ^b Variance
1	fear-terror	3	35.1
	anger-rage	3	
	distress-anguish	2	
	disgust-revulsion	2	
	contempt-scorn	1	
2	interest-excitement	3	16.4
3	fatigue-sleep	3	8.4
4	enjoyment-joy	3	6.6
5	shame-humiliation (guilt)	3	6.1
	disgust-revulsion	1	
	contempt-scorn	1	
6	surprise-startle	3	3.9
7	shame-humiliation (shyness)	2	3.8

^aNumber of items with high factor loadings (>.50)

^bPercent of total variance.

A significant feature of the rotated factor solution presented in Table 9.5 is the number of emotions for which all three items group together as a distinct factor. For seven of the possible 11 emotions all three items had high loadings on the same factor. On Factor 7 with two items from the shame-humiliation (shyness) emotion the item with the next highest loading was "sheepish", the third S-H(S) item, with a loading of .43.

As was the case with the four separate analyses, the first factor was a composite of four emotions: anger-rage, distress-anguish, disgust-revulsion, and fear-terror. The items for these emotions all had very low mean ratings indicating that generally they were "not at all" reported in the situations being examined.

In short, factor analysis of the structure of the DES responses over the four situations separately and for the combined set of data, indicated that Factor 1 consisted of a grouping of all the emotions "not at all" experienced in the situations presented. The second factor generally grouped those emotions which showed elevated means in each of the situations, thereby indicating the particular pattern of emotions reported in that situation.

Emotion Profiles

The form of the DES used in this study consisted of 11 sets of three items. Each set of three items is assumed to function as a separate subscale and the set of subscale scores can be used to construct a profile of the pattern of emotions experienced.

Izard et al. (1974) report alpha coefficients for the three item subscales in excess of .80. Alpha coefficients were calculated for each of the emotion scales in each test situation. The full set of results is presented in Appendix V. The coefficients found in this study were generally in the range reported by Izard although there were a few which were considerably lower than expected. The low alpha coefficients were found on different scales for different situations: e.g., shame-humiliation (shyness) had coefficients of .69, .29, .75, and .79 across the four situations and shame-humiliation (guilt) had coefficients of .82, .53, .26, and .70. No one emotion had a low alpha coefficient for all four test situations. The four emotions with the highest mean ratings; interest-excitement, enjoyment-joy, surprise-startle and fear-terror, had very high alpha coefficients ranging from .79 to .96.

The emotion profiles are therefore of considerable interest for detecting differences and similarities in the emotions reported for the four curiosity situations. Ratings were summed across the three items for each of the 11 subscales for each situation separately, and the mean rating for each used to construct the emotion profiles. Figures 9.1 to 9.4 present the profiles for the four curiosity-type by curiosity-intensity situations.

The profile for the high depth of interest curiosity situations is shown in Figure 9.1. An inspection of Figure 9.1 indicates that interest-excitement had a very high mean rating. Enjoyment-joy and surprise-startle were also elevated but to a lesser extent. All other emotions had very low mean ratings.

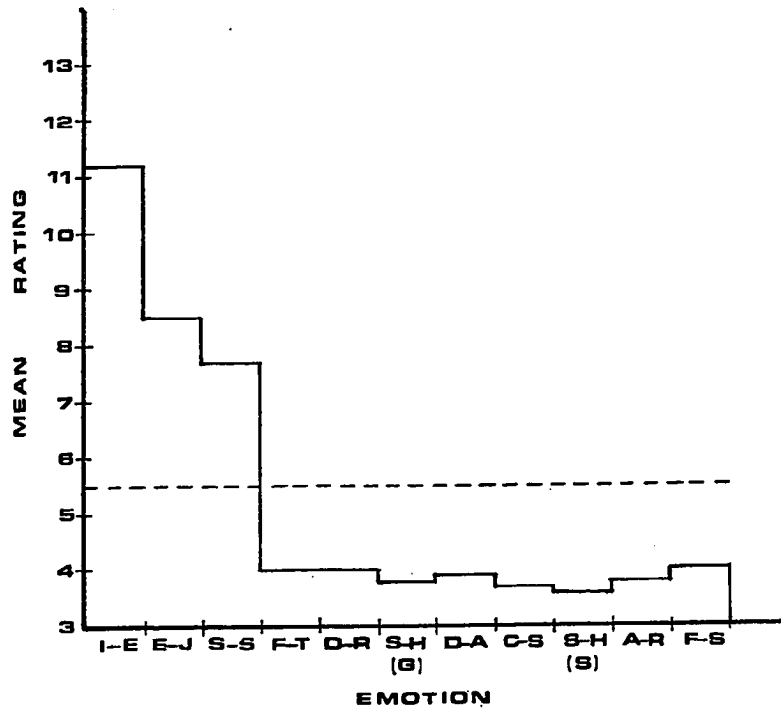


Figure 9.1 Profile of emotions: high depth of interest curiosity.

The profile for the low depth of interest curiosity situation presented in Figure 9.2 shows lower mean ratings for interest-excitement, enjoyment-joy and surprise-startle than those in Figure 9.1. The mean rating for surprise-startle was slightly higher than that for enjoyment-joy. The mean rating for the other emotions were generally low though marginally higher than those in Figure 9.1.

Figure 9.3 presents the profile for the high breadth of interest curiosity situation. The mean ratings for interest-excitement and enjoyment-joy were both high, surprise-startle had a mean rating in the middle of the range, and fear-terror had a mean rating well above the suggested threshold. The other emotions had very low mean ratings.

The profile presented in Figure 9.4 shows several strong differences from that in Figure 9.3. Enjoyment-joy had a very low mean rating while fear-terror had a very high one. The ratings for the other negative emotions were generally higher in the low than in the high breadth of interest curiosity situation, in some cases by as much as two units. However, these levels did not exceed the threshold of 5.5. Interest-excitement and surprise-startle had similar mean rating levels on both breadth of interest curiosity profiles.

In summary, the key emotion in both types of curiosity situation was interest-excitement. The low intensity situations of both types showed slightly lower levels of interest-excitement than did the high intensity situations although the levels in all four situations were well above the suggested threshold of 5.5. Interest-excitement grouped

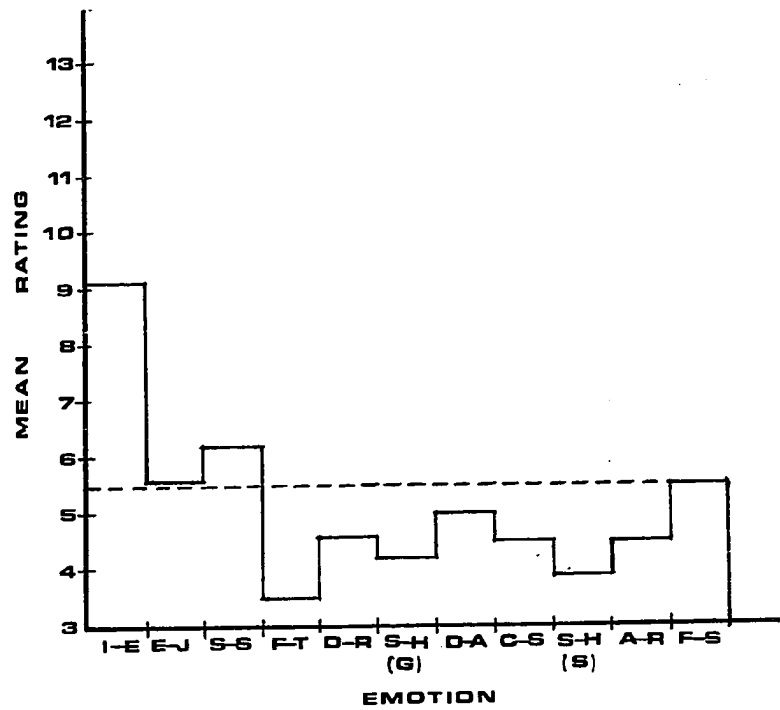


Figure 9.2 Profile of emotions: low depth of interest curiosity.

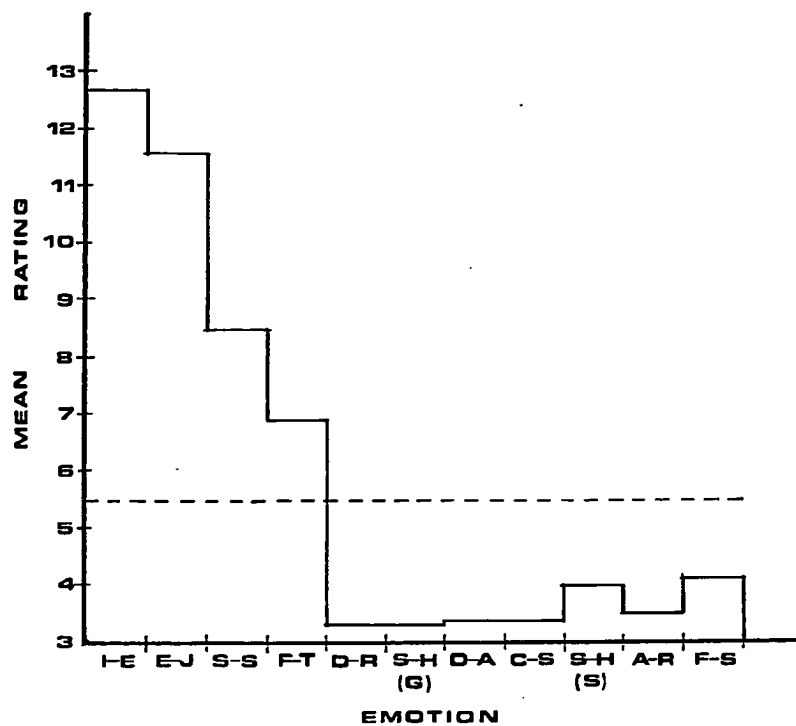


Figure 9.3 Profile of emotions: high breadth of interest curiosity.

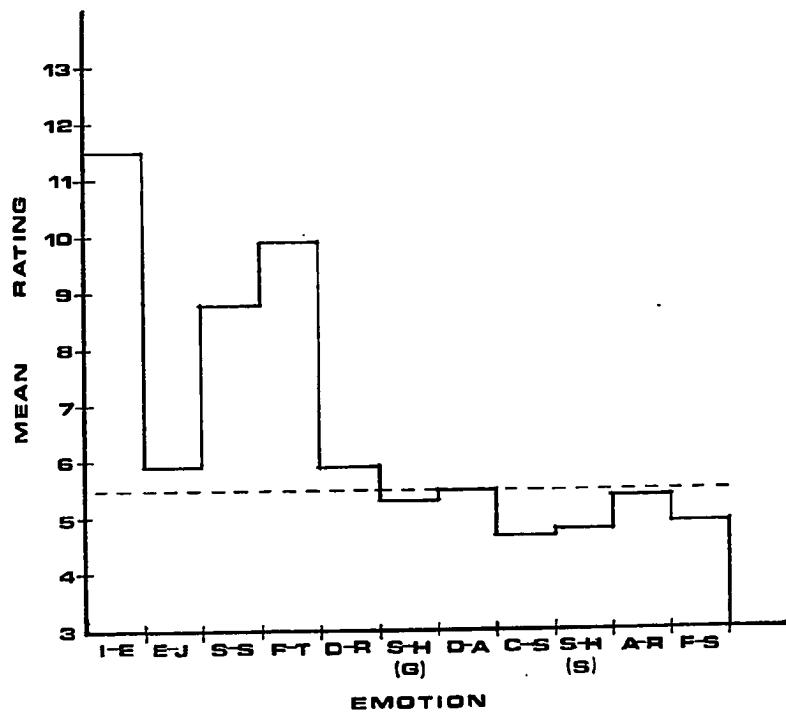


Figure 9.4 Profile of emotions: low breadth of interest curiosity.

with it enjoyment-joy and surprise-startle. The enjoyment-joy levels were lower than those for the interest-excitement items, and also showed a noticeable difference between the high and low intensity levels for both types of curiosity situation. The startle-surprise levels were lower than all of the interest-excitement levels, and lower than the enjoyment-joy level in the high intensity situations.

The breadth of interest curiosity situation profiles indicated a linking of fear-terror with the other three emotions. The level of fear-terror in the high breadth of interest situations was above the 5.5 threshold, and in the low breadth situation was at a level almost as high as that for interest-excitement.

Inspection of the patterning of reported emotions presented in the profiles for the four situations, suggested that a key difference between the depth and breadth of interest curiosity situations was the involvement of fear-terror in the latter.

Multivariate Analyses

The profiles show some clear differences between the emotions reported in the four curiosity situations. These differences between situations were examined by assessing the statistical significance of the differences in the levels of each of the four emotions which had mean ratings above Izard's suggested 5.5 threshold: interest-excitement, enjoyment-joy, surprise-startle and fear-terror. The two measurement variables were combined with the respondent's scores on the two subscales of the Two Factor Curiosity Scale to make up a 2 x 2

x 2 x 2 MANOVA. The first two factors were the respondent's level of depth of interest curiosity (high or low), and breadth of interest curiosity (high or low). The second two elements of the design consisted of two repeated measures variables: situation-type (depth or breadth) and situation-intensity (high or low).

McCall and Appelbaum (1973) suggest that conventional analysis of variance designs require quite stringent assumptions about the variance-covariance structure of the data which are rarely met in repeated measures designs. The outcome of violation of these assumptions is too frequent rejection of the null hypothesis. To overcome this difficulty at the sacrifice of some power in the analysis they suggest that a set of independent contrasts for the repeated measures be used as the dependent variables in a multivariate analysis of variance.

Appendix W details the matrix of correlations between repeated assessments for the 2 x 2 between-subjects groupings. It is clear from the size of the differences between these correlations that the covariance assumptions for the conventional analysis of variance design are not met with these data.

The analysis used was MULTIVARIANCE (Finn, 1976), and separate analyses were carried out for each of the four emotions. The analysis generated a multivariate F ratio which can be used in testing the significance of all interaction terms of all four dependent variables simultaneously. It also provides a set of univariate F ratios for each dependent variable separately. These are not independent, as the dependent variables are correlated, but they can be used to identify

those measures contributing to a significant outcome of the multivariate test.

It is important to note that there is no strong relationship between the multivariate test criterion and the separate univariate results. A multivariate statistic may be significant when none of the univariate statistics is significant; conversely, one or more of the univariate statistics may be significant when the multivariate statistic is not. We rely upon the multivariate test statistic for the initial decision about H_0 . Without the protection of the multivariate test, separate univariate decisions are likely to inflate statistical error rates dramatically.

(Finn & Mattsson, 1978, p. 75)

This approach was adopted in considering the results of the four analyses. The null hypothesis was only rejected when the multivariate F ratio was significant. When the multivariate F ratio was not significant the univariate results were inspected for any trends which they might suggest.

Interest-excitement. Table 9.6 presents the results of the analysis for the interest-excitement items. The multivariate F ratio indicated a significant difference between ratings over the curiosity situations. The univariate results indicated significant main effects of situation-type and situation-intensity but no interaction between them.

Table 9.7 presents the pattern of means and standard deviations for the situation-type effect and Table 9.8 the situation-intensity effect. Both types of curiosity situation had relatively high mean ratings for interest-excitement with that for breadth of interest curiosity being significantly higher than depth of interest curiosity.

Table 9.6
Multivariate Analysis of Interest-Excitement Scores

Source of Variation	Multivariate Analysis (4,29 df)		Univariate df	Univariate Analysis	
	F	p		F	p
Constant	339.86	<.001	1	11.90	<.001
Situation type				11.68	<.001
Situation intensity				1.04	.32
Type x intensity					
Depth of interest trait ^a					
Between depth levels			1	3.53	.07
Depth x situation type	1.79	.16		2.09	.16
Depth x situation intensity				.33	.57
Depth x type x intensity				.13	.73
Breadth of interest trait ^b					
Between breadth levels			1	.02	.90
Breadth x situation type	1.92	.13		3.38	.08
Breadth x situation intensity				1.02	.32
Breadth x type x intensity				.37	.55
Depth x breadth ^c					
Depth x breadth	1.59	.20	1	.40	.53
Depth x breadth x situation type				3.16	.09
Depth x breadth x situation intensity				.34	.56
Depth x breadth x type x intensity				.07	.80

^aEliminating Constant and Breadth effects.
^bEliminating Constant and Depth effects.
^cEliminating effects in all other groups.

The situations used for the high intensity criterion elicited higher interest-excitement scores than did those used for the low intensity criterion.

Table 9.7
Interest-Excitement: Means and Standard Deviations
for Situation-Type Effect

	Situation-Type	
	DEPTH	BREADTH
<u>M</u>	10.17	12.08
<u>SD</u>	2.47	2.50

Table 9.8
Interest-Excitement: Means and Standard Deviations
for Situation-Intensity Effect

	Situation-Intensity	
	High Curiosity	Low Curiosity
<u>M</u>	11.93	10.33
<u>SD</u>	2.13	2.44

The results of the multivariate analysis presented in Table 9.6 showed that the two trait curiosity factors were not significantly

related to the criterion measures. However, several of the univariate tests had F ratios approaching the conventional significance criterion of $p < .05$ and these have been inspected: the main effect of depth of interest trait curiosity $p < .07$, breadth of interest trait by situation-type effect $p < .08$, and the depth of interest trait by breadth of interest trait by situation-type effect $p < .09$.

The mean ratings on interest-excitement for the two trait curiosity factors are set out in Table 9.9. There appeared to be a tendency for the difference on measured depth of interest trait curiosity to be associated with differential interest-excitement responsiveness. There was no similar pattern of differences with the trait of breadth of interest curiosity.

Table 9.9
Interest-Excitement: Means and Standard Deviations
for Trait Curiosity Factors

Level	Trait			
	Depth Curiosity		Breadth Curiosity	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
HIGH	11.66	3.22	11.07	3.73
LOW	10.37	3.32	11.18	2.89

The MANOVA results presented earlier in Table 9.6 suggested that there was some evidence of an interaction between the trait factors and situation-type. The depth by situation-type analysis yielded $p < .16$, the breadth by situation-type $p < .08$, and the three-way interaction $p < .09$. These p values, although not regarded as statistically significant, are considerably lower than the other univariate results. The mean ratings for the subgroups of this three-way interaction are set out in Table 9.10 and Figure 9.5.

Table 9.10
Interest-excitement: Mean Ratings for Depth of Interest Trait
by Breadth of Interest Trait by Situation-Type

Situation -Type	Trait Factor			
	High Depth		Low Depth	
	High Breadth	Low Breadth	High Breadth	Low Breadth
DEPTH	10.77	11.33	7.79	9.93
BREADTH	12.00	12.55	13.36	10.44

Three of the groups - high depth/high breadth, high depth/low breadth, and low depth/low breadth - showed similar patterns of responsiveness to the situations with slight differences in the level of responsiveness. The low depth/high breadth group had a steeper

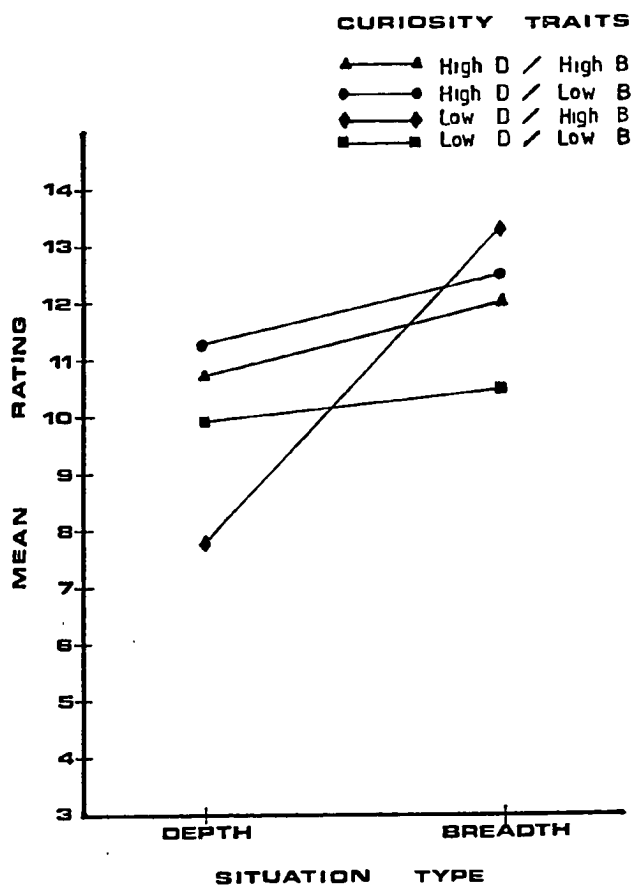


Figure 9.5. Interest-excitement: Depth of interest by breadth of interest by situation-type.

gradient of difference between the two situation types: it had the lowest mean rating for the depth situation and the highest for the breadth situation. For this particular combination of the trait factors there was a difference in interest-excitement responsiveness to the two types of situation. The difference was in the direction of very low responsiveness to the depth situations and very high responsiveness to the breadth situations.

Enjoyment-Joy. The results of the multivariate analysis for the enjoyment-joy scores are presented in Table 9.11. The results indicated a significant difference in responsiveness to the four situations. The univariate analysis of the interaction situation-type by situation-intensity was significant with $p < .001$. Inspection of the univariate results indicated that there was only one analysis which suggested the possibility of some differential responsiveness to the situations associated with the trait curiosity factors. The breadth by situation-type analysis yielded $p < .03$ and so this pattern of means was examined.

The pattern of the situation-type by situation-intensity interaction is presented in Figure 9.6 and the corresponding mean ratings in Table 9.12. The low intensity situations of both types were associated with very low enjoyment-joy ratings. Both high intensity situations had significantly higher levels of enjoyment-joy and within the high intensity situations there was a marked difference; the breadth of interest curiosity situation mean was more than three units higher than that for the depth of interest situation.

Table 9.11
Multivariate Analysis of Employment-Joy Scores

Source of Variation	Multivariate Analysis (4, 31 df)		Univariate df	Univariate Analysis	
	F	p		F	p
Constant	187.71	<.001	1		
Situation type					13.96 <.001
Situation intensity					123.06 <.001
Type x intensity					22.13 <.001
Depth of interest trait ^a			1		
Between depth levels	.37	.83			.58 .45
Depth x situation type					1.01 .32
Depth x situation intensity					.01 .91
Depth x type x intensity					.11 .74
Breadth of interest trait ^b			1		
Between breadth levels	1.72	.17			.09 .77
Breadth x situation type					5.12 .03
Breadth x situation intensity					.28 .60
Breadth x type x intensity					.04 .83
Depth x breadth ^c			1		
Depth x breadth	.34	.85			.05 .83
Depth x breadth x situation type					.58 .45
Depth x breadth x situation intensity					.08 .78
Depth x breadth x type x intensity					.96 .33

^aEliminating Constant and breadth effects.

^bEliminating Constant and Depth effects.

^cEliminating effects in all other groups.

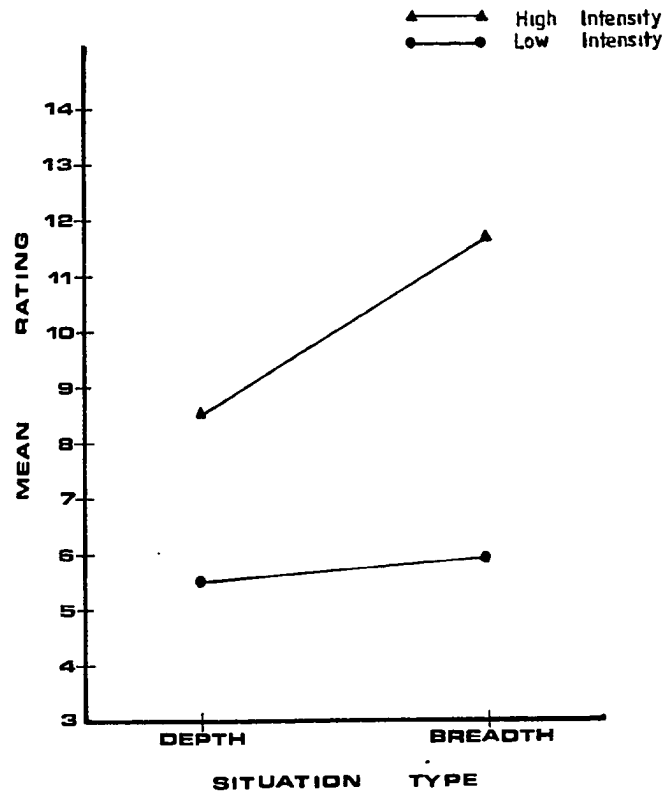


Figure 9.6. Enjoyment-joy: Situation-type by situation-intensity.

Table 9.12
 Enjoyment-Joy: Mean Ratings for Situation-Type
 by Situation-Intensity Effect

Intensity	Situation-Type			
	Depth		Breadth	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
HIGH	8.47	2.87	11.61	2.73
LOW	5.58	2.53	5.87	3.13

The univariate result for the breadth by situation-type analysis suggested that there may have been some tendency for differences in enjoyment-joy responsiveness to the situation types to vary with levels of breadth of interest trait curiosity. Table 9.13 and Figure 9.7 present the pattern of means for this analysis. They suggest that there was a tendency for respondents with higher scores on the breadth of interest trait scale to show a greater difference in responsiveness to the two types of situation than did those with lower scores.

Table 9.13
 Enjoyment-Joy: Mean Ratings for Breadth of Interest
 Trait by Situation-Type

Situation -Type	Trait Factor			
	High Breadth		Low Breadth	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
DEPTH	6.37	2.95	7.68	2.98
BREADTH	9.16	4.21	8.32	3.89

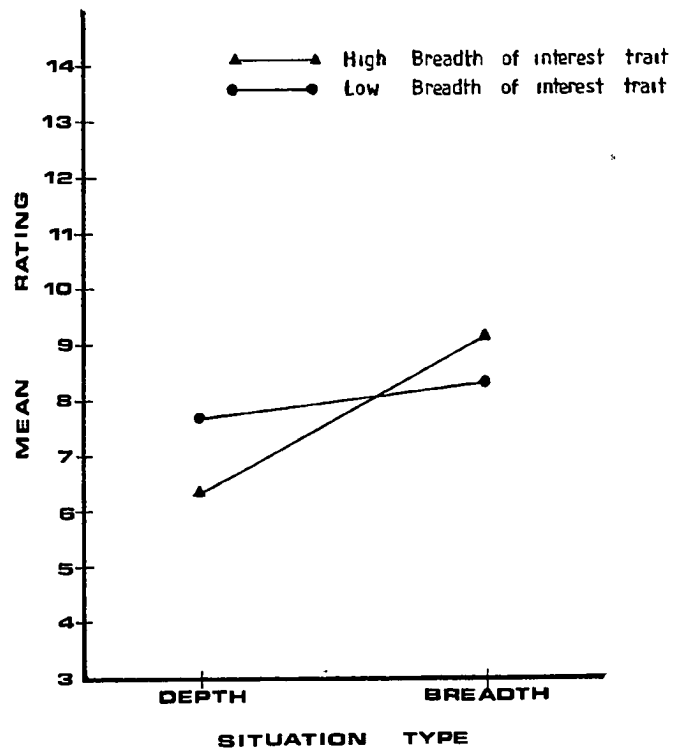


Figure 9.7 Enjoyment-joy: Breadth of interest trait by situation-type.

Table 9.14
Multivariate Analysis of Surprise-Startle Scores

Source of Variation	Multivariate Analysis (4,30 df)		Univariate df	Univariate Analysis	
	F	P		F	P
Constant	111.66	<.001	1		
Constant				10.04	<.01
Situation type				1.17	.29
Situation intensity				6.89	<.01
Type x intensity					
Depth of interest trait ^a			1	1.46	.24
Between depth levels				.49	.49
Depth x situation type		.63		.10	.74
Depth x situation intensity				.10	.74
Depth x type x intensity				.39	.54
Breadth of interest trait ^b			1	.38	.54
Between breadth levels				.08	.79
Breadth x situation type		.47		.42	.49
Breadth x situation intensity				2.17	.15
Breadth x type x intensity					
Depth x breadth ^c			1	.72	.40
Depth x breadth				1.08	.31
Depth x breadth x situation type				.05	.82
Depth x breadth x situation intensity				.67	.42
Depth x breadth x type x intensity					

^aEliminating Constant and Breadth effects.

^bEliminating Constant and Depth effects.

^cEliminating effects in all other groups.

Surprise-Startle. The results of the multivariate tests for the surprise-startle responses are presented in Table 9.14. There were no differences in the surprise-startle ratings associated with the trait levels of depth of interest and breadth of interest curiosity. The test for differences in response across the four situation had a multivariate F with $p < .001$. This effect was examined through the interaction of situation-type by situation-intensity ($p < .01$). Table 9.15 and Figure 9.8 present the pattern of results for this analysis.

Table 9.15
Surprise-Startle: Mean Rating for Situation-Type by
Situation-Intensity Effect

Intensity	Situation-Type			
	Depth		Breadth	
	M	SD	M	SD
HIGH	7.66	2.79	8.47	3.52
LOW	6.16	3.18	8.78	3.75

The mean rating was higher in the breadth curiosity situations of both intensities than in the depth curiosity situations. The difference in responsiveness between situation types for the high intensities was smaller than that for the low intensities, and the difference in responsiveness for the two intensity levels was greater for the depth situations than for the breadth situations.

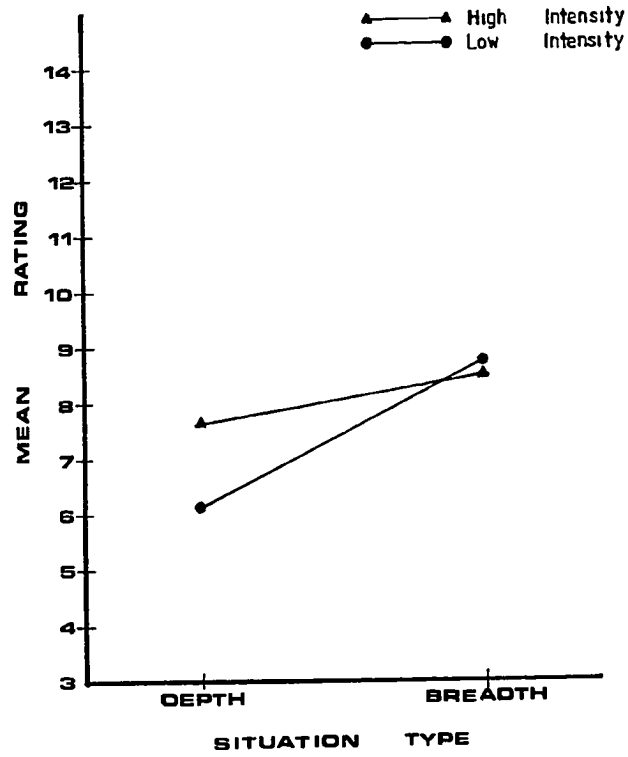


Figure 9.8. Surprise-startle: Situation-type by situation-intensity.

Table 9.16
Multivariate Analysis of Fear-Terror Scores

Source of Variation	Multivariate Analysis		Univariate df	Univariate Analysis	
	F	P		F	P
Constant			1		
Constant	189.89	<.001		169.00	<.001
Situation type				8.48	<.01
Situation intensity				28.05	<.001
Type x intensity					
Depth of interest trait ^a			1		
Between depth levels	2.14	<.10		2.09	.16
Depth x situation type				8.21	<.01
Depth x situation intensity				1.05	.31
Depth x type x intensity				0.94	.34
Breadth of interest trait ^b			1		
Between breadth levels	2.07	<.11		6.47	<.02
Breadth x situation type				7.52	<.01
Breadth x situation intensity				.02	.89
Breadth x type x intensity				.36	.55
Depth x breadth ^c			1		
Depth x breadth	1.25	<.31		2.57	.12
Depth x breadth x situation type				4.56	<.04
Depth x breadth x situation intensity				.19	.66
Depth x breadth x type x intensity				.04	.85

^aEliminating Constant and Breadth effects.

^bEliminating Constant and Depth effects.

^cEliminating effects in all other groups.

Fear-Terror. As with the other three emotions there was a significant difference between the fear-terror ratings across the four situations. The multivariate analysis of the differences between the fear-terror scores for each of the situations yielded a value of $p < .001$ with a significant univariate result for the interaction between situation-type and situation-intensity (see Table 9.16). The multivariate analyses for the curiosity trait factors did not yield significant F ratios. However, a few of the associated univariate analyses had significant p values and these were inspected.

A significant interaction between situation-type and -intensity is shown in the results in Table 9.17 and Figure 9.9. The level of mean rating was very low for depth situations of both intensities. Both of these mean values were well below the 5.5 threshold suggested by Izard (1972a, 1977). The level of fear-terror reported for the breadth situations was considerably higher than that for the depth curiosity situations and it was the low breadth situation which had the highest mean rating.

Table 9.17
 Fear-Terror: Mean Ratings for Situation-Type by
 Situation-Intensity Effect

Intensity	Situation-Type			
	Depth		Breadth	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
HIGH	4.03	1.93	6.87	3.14
LOW	3.47	1.22	9.90	3.46

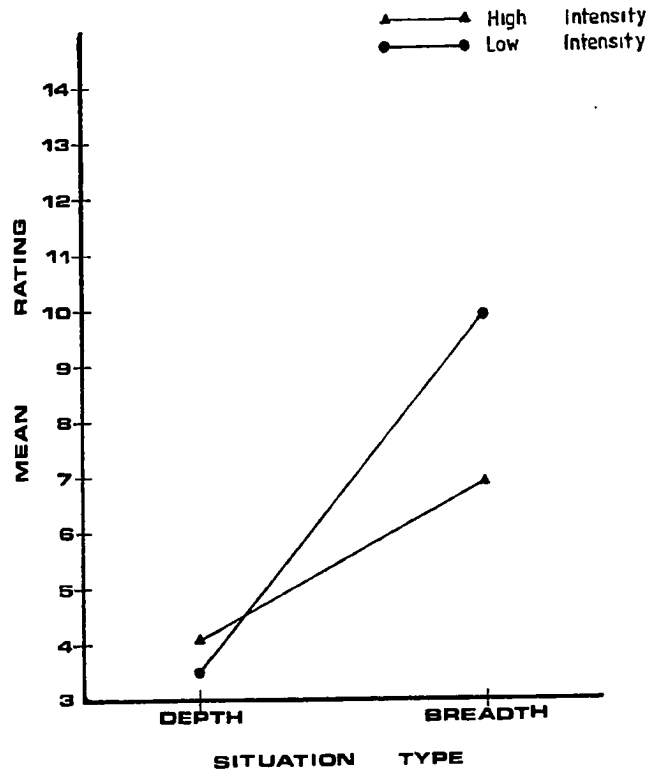


Figure 9.9 Fear-terror: Situation-type by situation-intensity.

The trait curiosity factors did not produce significant results in the multivariate analysis. However, the pattern of results on the univariate tests suggested that it was worth inspecting the three-way interaction of depth by breadth by situation-type (depth by situation-type $p < .01$, breadth by situation-type $p < .01$, and depth by breadth by situation-type $p < .04$). The pattern of results for these groups is presented in Table 9.18 and Figure 9.10.

For the depth curiosity situations high depth of interest trait groups irrespective of their level of breadth of interest trait, had slightly lower mean fear-terror ratings than did the low depth of interest trait groups.

For the breadth curiosity situations the two low depth of interest trait groups had higher mean fear-terror ratings than was the case in the depth situation, and the low depth/low breadth group had a higher mean fear-terror rating than did the low depth/high breadth group. The two high depth of interest groups also had higher mean fear-terror ratings than in the depth situation but there was a marked difference in the level of those ratings. The high depth/low breadth group had a much higher mean rating than did the high depth/high breadth group. There appears to have been a marked difference in the reported arousal of fear-terror for the high depth/low breadth and high depth/high breadth groups in the breadth curiosity situations.

Table 9.18
Fear-Terror: Mean Rating for Depth of Interest by
Breadth of Interest by Situation-Type

Situation -Type	Trait Factor			
	High Depth		Low Depth	
	High Breadth	Low Breadth	High Breadth	Low Breadth
DEPTH	3.14	3.55	4.06	4.19
BREADTH	7.00	9.91	7.56	9.00

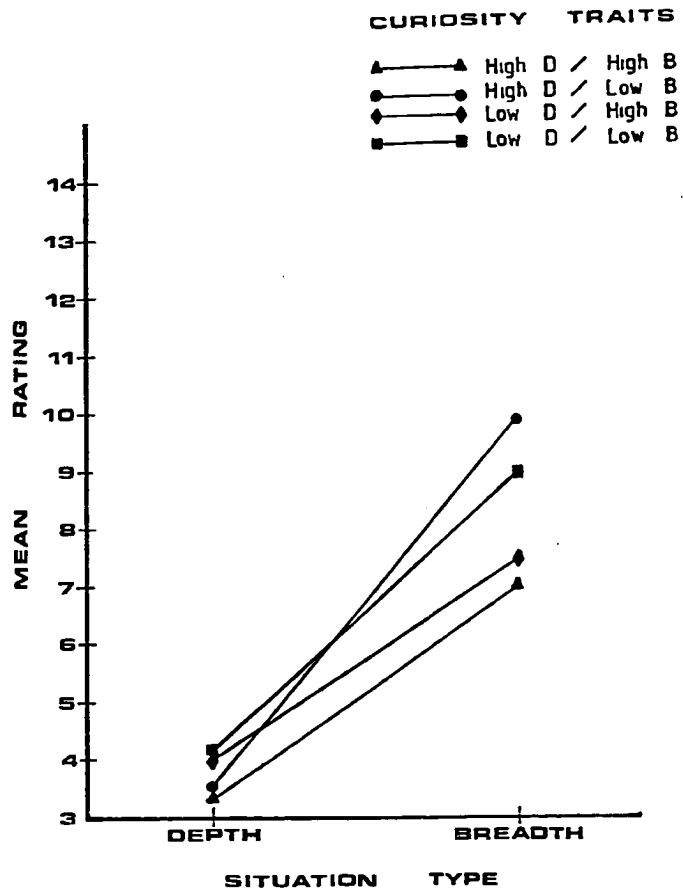


Figure 9.10 Fear-Terror: Depth of interest by breadth of interest by situation-type.

Summary

Both the emotion profiles and the multivariate analyses have shown that there were differences between the pattern of emotions aroused in each of the four curiosity-type by -intensity situations. Four emotions: interest-excitement, enjoyment-joy, surprise-startle, and fear-terror had relatively high mean ratings for the curiosity situations. The multivariate analyses have indicated that for each of these emotions there were significant differences in the levels reported for each of the curiosity situations.

For the emotion interest-excitement, the breadth of interest curiosity situations had significantly higher levels reported than did the depth of interest situations, and the high intensity situations higher levels than the low intensity situations. There was also some indication, not statistically significant, that the low depth/high breadth of interest curiosity trait group distinguished more sharply between the situation types than did the other groups. The low depth/high breadth group reported a very low level of interest-excitement in the depth situations and a very high level in the breadth situations.

For the emotion enjoyment-joy the high intensity curiosity situations showed significantly higher levels of reported enjoyment-joy than did the low intensity curiosity situations. This difference in reported enjoyment-joy according to situation intensity was more pronounced for the breadth than the depth situations. There was also some indication that respondents with higher scores on the breadth of interest curiosity scale had greater differences in reported enjoyment-joy between the depth and breadth situations than did those

with lower scores.

For the emotion startle-surprise there was a significant situation-type by situation-intensity effect. Both breadth situations had higher reported levels of startle-surprise than did the depth situations, and high depth of interest curiosity situations showed higher levels of startle-surprise than did the low depth situations.

Finally, for the emotion fear-terror there was a significant situation-type by situation-intensity effect. Depth of interest curiosity situations of both intensities had negligible levels of fear-terror reported. Breadth of interest curiosity situations of both intensities had effective levels of fear-terror reported with by far the highest level occurring for the low intensity breadth of interest curiosity situations.

Discussion

The Structure of the DES

The pattern of emotions experienced in any one situation specified in the DES instructions may be any combination of fundamental emotions and in any pattern of intensities. The factor structure for the responses from a particular situation reflects that pattern. If two emotions always occur together in the situation, the factor structure will show both emotions loading on the same factor. On the other hand, DES responses combined over a variety of situations each having its own particular combination of emotions, would be

expected to produce a factor structure characterized more by distinct groupings. The degree to which this is true will depend upon the range of situations in that set. In the present study the set was limited to two types of curiosity situation and two intensities within those types.

In the data combined across all four situations there was a marked tendency for each set of three emotion items to group together as distinct factors. This pattern was more pronounced for emotions which were "relevant" to some or all of the curiosity situations: interest-excitement, enjoyment-joy, surprise-startle, and fear-terror. This together with the generally sound pattern of alpha coefficients suggests that the DES was an appropriate instrument with which to measure the emotions underlying each of the four curiosity situations.

Situation-Type: Depth and Breadth

The key emotion reported for both depth of interest and breadth of interest curiosity situations was interest-excitement. In each situation the interest-excitement subscale had the highest rating. Enjoyment-joy and surprise-startle were also reported but to a lesser degree, and the breadth of interest curiosity situations also aroused fear-terror.

The high and low depth of interest curiosity situations appear to have the same emotional base. Depth of interest curiosity was characterized by high interest-excitement and moderate levels of enjoyment-joy and surprise-startle. The low depth of interest

curiosity situations had basically the same pattern of emotions but at a lower level of intensity: a moderate level of interest-excitement and low levels of enjoyment-joy and surprise-startle. The negative emotions though still very low were marginally higher in the low intensity situations. The factor analysis results suggested that the three critical emotions were generally linked together in depth of interest curiosity situations of both intensities.

The high and low breadth of interest curiosity situations had some different emotional bases. Both had very high levels of interest-excitement and the same moderate level of surprise-startle, but had different levels of enjoyment-joy and fear-terror. For the high breadth of interest curiosity situations enjoyment-joy was high and fear-terror present but at a low to moderate level. The reverse occurred with low breadth of interest curiosity situations: enjoyment-joy was barely above the suggested threshold while fear-terror was moderate to high. These high breadth situations were characterized by strong opposing tendencies of interest-excitement and fear-terror. Given that there was only a small difference between the levels of interest-excitement for the high and low intensity breadth of interest curiosity situations, the fear-terror arousal seems to be a critical element in an individual's response to the situation accounting for the difference between "Like very much" (4) and "Do not like at all" (1) responses on the Two Factor Curiosity Scale. The other negative emotions were stronger in the low breadth situations bringing them much closer to the suggested threshold level.

The factor structure of the breadth of interest curiosity situations indicated that the pattern of these emotions was more

variable across respondents than was the case for the depth curiosity situations.

Situation-Intensity

The situations were chosen to represent different intensity levels for both types of curiosity. Analysis of the pattern of emotions reported in each of the four situations has indicated that the levels of the critical emotions were different according to the intensity level (high or low) of that situation.

Trait Curiosity and DES Responses

There were no statistically significant differences in the patterns of DES responses contingent upon the trait curiosity characteristics of the respondents. The design of this study has minimized the operation of such effects through the means of choosing the particular situations presented to represent the high and low depth of interest and breadth of interest curiosity dimensions. Situations were chosen which were known to be high and low respectively for individual respondents. Therefore, the test material was less likely to be sensitive to differences in responsiveness contingent upon trait characteristics than would have been the case if all respondents had been presented with the same content for the four test situations.

Although the results from the multivariate analyses dealing with

the trait factors were not statistically significant there was some suggestion that trait characteristics may have influenced responsiveness to the type of situation for two of the important emotions: interest-excitement and fear-terror. The univariate results for the trait by situation-type analyses for interest-excitement were approaching acceptable levels of significance. The trait by situation-type univariate analyses for fear-terror had significant F ratios.

The direction of these effects is of interest. Those who on the Two Factor Curiosity Scale had low depth of interest scores and high breadth of interest scores showed very low interest-excitement levels to depth curiosity situations and high levels of responsiveness to breadth curiosity situations. For this group the contrast between these two types of situation was far greater than that shown in all of the other groups.

The low breadth of interest trait groups had higher levels of fear-terror than did the high breadth of interest trait groups and the contrast between fear-terror levels for the situation types was most marked in those respondents who had high scores on the depth of interest trait scale and low scores on the breadth of interest trait scale. Taking together the interest-excitement and fear-terror patterns suggests that the differences in breadth of interest trait for the high depth trait group is a difference in fear-terror responsiveness. The groups have very similar patterns of interest-excitement across the situations but very different levels of fear-terror.

Conclusion

The study reported in this chapter has attempted to extend what is known about the processes which operate when curiosity is aroused, by exploring the nature of the affective-cognitive structures which constitute breadth of interest and depth of interest curiosity.

The DES was used to determine the pattern of emotions underlying two types of curiosity situation: depth of interest curiosity and breadth of interest curiosity. In both types of curiosity situation the emotions of interest-excitement, enjoyment-joy and surprise-startle were reported, with interest-excitement being the strongest emotion. Breadth of interest curiosity was distinguished by the involvement of an additional emotion, fear-terror. This was the critical element distinguishing between situations which respondents judged they would like to experience and those that they would like to keep at a distance. This finding is consistent with Zuckerman's (1979) description of the sensation seeker. Arguing from a modified arousal orientation Zuckerman suggested that:

Sensation seekers are generally hedonists who seek pleasurable arousal. Although they do sometimes take risks that incur fear arousal... it is their incurable optimism that the risky activity will bring more pleasure than pain... they appraise risk as less and expect to experience less anxiety than do low-sensation seekers in response to the same high-risk situations. They also expect to experience more positive sensation-seeking arousal in these situations.

(Zuckerman, 1979, p. 357)

There were no significant differences between the patterns of emotions found in the test situations contingent upon differences in the two trait curiosity factors although some interesting trends were

evident in the data. The absence of differences related to trait curiosity may have been due to the procedure used for selecting the test situations.

The findings of this study have demonstrated that Izard's differential emotions theory offers a useful explanatory framework within which to explore the nature of the processes which operate when curiosity is aroused. Differential emotions theory proposes that the selectivity of complex human behaviour can best be explained in terms of the operation of affective-cognitive structures. Approach to novelty is viewed as an outcome of the excitation of affective-cognitive structures focussed around the emotion interest-excitement. In this chapter the patterns of emotions which go to make up the affective-cognitive structures of breadth of interest and depth of interest have been explored.

Breadth of interest curiosity and depth of interest curiosity are different affective-cognitive structures. The types of situations prompting approach are different and the quality of engagement with those situations is different. As has been made explicit in earlier chapters, breadth of interest curiosity is an orientation towards seeking change and variation. The quality of involvement is one of seeking change to experience what it is like. The study reported in this chapter has indicated that the affective components of this affective-cognitive structure are focussed on the emotion interest-excitement and have associated with that arousal of the emotion fear-terror. The level of fear-terror aroused appears to be critical in determining the response of approach or withdrawal. Enjoyment-joy and surprise-startle were also reported in the breadth of interest

situations as subsidiary emotions which combine with interest-excitement and fear-terror to give this affective-cognitive structure its particular affective qualities.

Depth of interest curiosity is an orientation towards exploring and investigating new events, ideas, and puzzling phenomena. The quality of involvement is one of experiencing the new to achieve an understanding of it. As for breadth of interest curiosity, the results reported in this chapter indicated that the depth of interest affective-cognitive structure was also focussed around the arousal of interest-excitement. The emotions of enjoyment-joy and surprise-startle were also components.

SECTION II:

BREADTH AND DEPTH OF INTEREST CURIOSITY STYLES

SUMMARY

The five chapters in this section have been concerned with investigations into the validity of a two factor construct of curiosity. In Section I it was argued that a two factor construct of curiosity distinguishing between breadth of interest and depth of interest styles of approach to novelty provides a coherent framework which effectively describes the range of behaviour which has been labelled curiosity. It was also suggested that differential emotions theory, through its analysis of affective-cognitive structures, presents the most comprehensive framework within which the nature of different curiosity styles can be explored. The five chapters of this section have attempted to verify these propositions.

Chapter Five presented a review of the main forms of measurement which have been used in the assessment of curiosity in children and adults. From this review a number of conclusions were drawn. The research results did not support the view that curiosity is a unitary construct. A two factor construct distinguishing breadth of interest and depth of interest curiosity dimensions is more consistent with the pattern of research findings.

In Chapter Six the construction of a scale to measure accurately these two curiosity dimensions was reported. Scores from existing scales chosen to represent the range of measures currently in use were factored to test the adequacy of the two factor model in accounting for the pattern of responses to those scales. The results indicated two main dimensions, and from the pool of test items provided by those scales a short scale (the Two Factor Curiosity Scale) was constructed.

A validity study was reported in Chapter Seven in which the Two Factor Curiosity Scale was administered to a new group of respondents who differed from the group participating in the construction and development studies both in age and range of ability. Detailed examination of this set of scores supported the conclusion that the scale has sound psychometric properties. Factor analysis of the responses indicated that the internal structure of the Two Factor Curiosity Scale consisted of two separate dimensions.

A further validation study was presented in Chapter Eight in which the construct validity of the Two Factor Curiosity Scale was assessed. Scores on the Two Factor Curiosity Scale were compared with those obtained by the same group on the Career Assessment Inventory (CAI; Johansson, 1982). Discriminant function analyses of scores from the various indices of the CAI for four separate curiosity style groups consistently produced one main discriminant function separating the groups. Examination of the substantive nature of these functions led to the conclusion that the Two Factor Curiosity Scale has a high degree of construct validity.

The final chapter in this section has attempted to extend what is

known about the nature of the processes which operate when curiosity is aroused by linking the two factor classification of curiosity styles with differential emotions theory. The Differential Emotions Scale was used to determine the patterns of emotions which constituted the two affective-cognitive structures of breadth of interest and depth of interest curiosity. Interest-excitement was the key emotion reported for both types of curiosity style. However, the pattern of emotions linked with that key emotion differed for the two curiosity styles. The affective-cognitive structure of depth of interest curiosity grouped enjoyment-joy and surprise-startle with interest-excitement. The affective-cognitive structure of breadth of interest curiosity included in addition, the negative emotion fear-terror.

CHAPTER 10

CONCLUSIONS

In the introduction to this thesis it was stated that the construct of curiosity has always figured prominently in discussions of the nature and purpose of education. The same discussions have often assumed that the construct of curiosity has a widely-accepted if not well-defined, meaning. Even a cursory reading of the literature quickly demonstrates that this is not the case. Any attempt to understand the often lamented disappearance of a child's "natural curiosity" through exposure to formal schooling, is hampered by the variety of ways in which the construct has been used, and the lack of a clear framework integrating that variety of usage.

This thesis has examined the construct of curiosity as it has been used in the research literature and has attempted to draw out those elements from that body of research which together can provide a synthesis of current knowledge, and generate further understanding of human curiosity. It has been argued that a construct of curiosity which subsumes two distinct styles, breadth of interest curiosity and depth of interest curiosity, has the potential to provide such a synthesis.

Section I presented a review of prominent descriptive classifications and theories of curiosity. Chapter Two reviewed the wide range of definitions and classifications of curiosity which appear in the research literature. At the end of that chapter it was

proposed that a two factor construct of curiosity distinguishing between breadth of interest and depth of interest styles of approach to novelty, provides a coherent framework which effectively describes the range of behaviour which has traditionally been classified as "curiosity". Curiosity, it was suggested, is best conceptualized as a construct which subsumes two distinct dimensions. Both dimensions involve approach to novelty but the forms of novelty which prompt approach are distinctively different. One dimension, the breadth of interest curiosity style, consists of a positive orientation towards varied and changing experiences; a wanting to know expressed through the sampling of new sensations and experiences. The second dimension, the depth of interest curiosity style, consists of a positive orientation towards complex ideas and puzzling phenomena; a wanting to know expressed through seeking to understand the particular puzzling phenomenon.

Chapters Three and Four outlined some of the theories which have sought to delineate the processes which are operating in situations where curiosity is aroused. The optimal arousal, cognitive, and differential emotions theories were all described and examined in detail. Optimal arousal theories have suggested that curiosity can best be explained in terms of the level of arousal operating in a situation. There are two critical elements: the relative levels of collative variability (with their differences in arousal potential) among competing stimuli, and the individual's level of general arousal. That stimulus with a level of arousal potential which moves the individual's arousal closer to their optimum level will be selected over others and explored. The level of general arousal is seen as the crucial mediating variable. Cognitive theories, on the

other hand, posit the selectivity of behaviour at the level of the information processing which occurs when stimuli are encountered. The critical element in understanding curiosity is then suggested to be the relationship between the incoming signals as perceived and the individual's expectations or anticipations. Mismatch or incongruity between signal and expectancy leads to exploration of the novel signal. The third theory, differential emotions theory, suggests that curiosity be considered as an "affective-cognitive structure" elaborated from innate emotion processes. Approach to novelty is seen as the outcome of excitation of the emotion interest-excitement. It is through the affective-cognitive structures focussed around this emotion that the information properties of a situation initiate and direct exploratory behaviour.

It was argued that the differences between these three theories are basically differences in emphasis, especially with respect to which variable or set of variables, is critical in directing approach to novelty. Examination of the experimental evidence which purports to demonstrate the role of arousal as a crucial mediator of the effects of collative variability on exploratory behaviour has shown this evidence to be inconclusive. As a result, the difference between optimal arousal and cognitive theories in their explanations of approach to novelty is reduced to a difference between the motivating effects of "uncertainty" and "incongruity". Cognitive theories have emphasized the the importance of the relationship between the information properties of the stimulus and the individual's expectations in directing behaviour, but this leaves the basis for the selectivity of the expectations unresolved. Differential emotions theory postulates that the selectivity of behaviour can be accounted

for by emotion processes and their affective-cognitive derivatives. The information properties of the stimulus through their excitation of the emotion interest-excitement guide exploratory behaviour.

The conclusion was drawn that differential emotions theory, and more particularly its affective-cognitive structures construct, presents the most comprehensive theoretical framework within which the nature of different curiosity styles can be explored.

Section II addressed some of the research questions generated by the adoption of this framework for the understanding of curiosity. The first of these was the need for construction and validation of a measure of curiosity which was able to distinguish effectively between the breadth of interest and depth of interest curiosity styles. The second involved an examination of the characteristic differences between the breadth of interest and depth of interest curiosity styles at the level of their component affective-cognitive structures.

In Chapter Five a review of the main forms of measurement which have been used in the assessment of curiosity in children and adults was presented. From that review a number of conclusions were drawn. The research results do not support the view that curiosity is a unitary construct. Rather, a two factor construct distinguishing breadth of interest and depth of interest curiosity dimensions appeared to be more consistent with the pattern of research findings.

In Chapter Six the construction of a scale to measure accurately these two curiosity dimensions was reported. Scores from existing scales, chosen to represent the range of measures currently in use,

were factored to test the adequacy of the two factor model in accounting for the pattern of responses to those scales. The results indicated two main dimensions, and from the pool of test items provided by those scales a short scale (the Two Factor Curiosity Scale) was constructed.

A validity study examining the internal structure of the Two Factor Curiosity Scale was reported in Chapter Seven. The scale was administered to a new group of respondents who differed from the group participating in the construction and development studies both in age and range of ability. Detailed examination of this set of scores supported the conclusion that the scale has sound psychometric properties. Factor analysis of the responses indicated that the internal structure of the Two Factor Curiosity Scale can be represented by two separate dimensions.

A further validation study was presented in Chapter Eight in which the construct validity of the Two Factor Curiosity Scale was assessed. Scores on the Two Factor Curiosity Scale were compared with those obtained by the same group on the Career Assessment Inventory (CAI; Johansson, 1982). Four curiosity style groups were defined by dividing the scores on each of the two curiosity dimensions at the median. Discriminant function analyses of the scores from the various indices of the CAI for these four curiosity style groups consistently produced one main discriminant function separating them. Examination of the substantive nature of these functions led to the conclusion that the Two Factor Curiosity Scale has a high degree of construct validity. The main discriminant function from the non-occupational indices of the CAI appeared to consist of a positive orientation

towards activities which lead to an increased experience and understanding of events, ideas, and natural phenomena. The main discriminant function derived from the general theme scales and the basic interest scales, was represented as a positive orientation towards understanding the "how" and "why" of events and situations, an analytical problem solving dimension which emphasizes logical, resourceful, and clear-thinking approaches to new situations and activities.

The final chapter has attempted to extend what is known about the nature of the processes which operate when curiosity is aroused by linking the two factor classification of curiosity styles with differential emotions theory. The Differential Emotions Scale was used to determine the patterns of emotions which constituted the two affective-cognitive structures of breadth of interest and depth of interest curiosity. Interest-excitement was the key emotion reported for both types of curiosity style. However, the pattern of emotions linked with that key emotion differed for the two curiosity styles. The affective-cognitive structure of depth of interest curiosity grouped enjoyment-joy and surprise-startle with interest-excitement. The affective-cognitive structure of breadth of interest curiosity included, in addition, the negative emotion fear-terror.

The construct of curiosity which has been developed in this thesis and the supporting theoretical structure of the differential emotions theory, provides a comprehensive framework within which issues concerning human curiosity can be investigated. Issues which have always troubled educational writers, such as the course of development of curiosity with experience of an institutionalized

education system, can be approached within a conceptual framework more readily amenable to the integration of particular observations and findings.

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APPENDIX A

COPIES OF ORIGINAL CURIOSITY SCALES REPRODUCED

FOR USE IN STUDY 6.1

Scales:

- A.1 Form K: Sensation Seeking Scale Form V
(Zuckerman, 1975)
- A.2 Form M: Novelty Experiencing Scale
(Pearson, 1970)
- A.3 Form P: Test of Intrinsic Motivation
(Beswick, 1974)
- A.4 Form R: Ontario Test of Intrinsic Motivation
(Day, 1971)
- A.5 Form S: Melbourne Curiosity Inventory - Trait Form
(Naylor, 1981)

A:1 FORM K

DIRECTIONS

Each of the items below contains two choices, A and B. Please indicate by circling EITHER A OR B which choice most describes your likes or the way you feel. In some cases you may find items in which both choices describe your likes or feelings. Please choose the one which better describes your likes or feelings. In some cases you may find items in which you do not like either choice. In these cases mark the choice you dislike least. Do not leave any items blank.

It is important you respond to all items with only one choice, A or B. We are interested only in your likes or feelings, not in how others feel about these things or how one is supposed to feel. There are no right or wrong answers as in other kinds of tests. Be frank and give your honest appraisal of yourself.

- 1 A. I like "wild" uninhibited parties.
B. I prefer quiet parties with good conversation.
- 2 A. There are some movies I enjoy seeing a second or even a third time.
B. I can't stand watching a movie that I've seen before.
- 3 A. I often wish I could be a mountain climber.
B. I can't understand people who risk their necks climbing mountains.
- 4 A. I dislike all body odours.
B. I like some of the earthy body smells.
- 5 A. I get bored seeing the same old faces everyday.
B. I like the comfortable familiarity of everyday friends.
- 6 A. I like to explore a strange city or section of town by myself, even if it means getting lost.
B. I prefer a guide when I am in a place I don't know well.
- 7 A. I dislike people who do or say things just to shock or upset others.
B. When you can predict almost everything a person will do and say he or she must be a bore.
- 8 A. I usually don't enjoy a movie or play where I can predict what will happen in advance.
B. I don't mind watching a movie or play where I can predict what will happen in advance.

- 9 A. I have tried marijuana or would like to.
B. I would never smoke marijuana.
- 10 A. I would not like to try any drug which might produce strange and dangerous effects on me.
B. I would like to try some of the new drugs that produce hallucinations.
- 11 A. A sensible person avoids activities that are dangerous.
B. I sometimes like to do things that are a little frightening.
- 12 A. I dislike "swingers".
B. I enjoy the company of real "swingers".
- 13 A. I find that stimulants make me uncomfortable.
B. I often like to get high (drinking liquor or smoking marijuana).
- 14 A. I like to try new foods that I have never tasted before.
B. I order the dishes with which I am familiar, so as to avoid disappointment and unpleasantness.
- 15 A. I enjoy looking at home movies and travel slides.
B. Looking at someone's home movies or travel slides bores me tremendously.
- 16 A. I would like to take up the sport of water-skiing.
B. I would not like to take up water-skiing.
- 17 A. I would like to try surf-board riding.
B. I would not like to try surf-board riding.
- 18 A. I would like to take off on a trip with no pre-planned or definite routes, or timetable.
B. When I go on a trip I like to plan my route and timetable fairly carefully.
- 19 A. I prefer the "down-to-earth" kinds of people as friends.
B. I would like to make friends in some of the "far-out" groups like artists or "hippies".
- 20 A. I would not like to learn to fly an aeroplane.
B. I would like to learn to fly an aeroplane.
- 21 A. I prefer the surface of the water to the depths.
B. I would like to go scuba diving.
- 22 A. I would like to meet some persons who are homosexual (men or women).
B. I stay away from anyone I suspect of being "queer".

- 23 A. I would like to try parachute jumping.
B. I would never want to try jumping out of a plane with or without a parachute.
- 24 A. I prefer friends who are excitingly unpredictable.
B. I prefer friends who are reliable and predictable.
- 25 A. I am not interested in experience for its own sake.
B. I like to have new and exciting experiences and sensations even if they are a little frightening, unconventional or illegal.
- 26 A. The essence of good art is in its clarity, symmetry of form and harmony of colours.
B. I often find beauty in the "clashing" colours and irregular forms of modern painting.
- 27 A. I enjoy spending time in the familiar surroundings of home.
B. I get very restless if I have to stay around home for any length of time.
- 28 A. I like to dive off the high board.
B. I don't like the feeling I get standing on the high board (or I don't go near it at all).
- 29 A. I like to date members of the opposite sex who are physically exciting.
B. I like to date members of the opposite sex who share my values.
- 30 A. Heavy drinking usually ruins a party because some people get loud and boisterous.
B. Keeping the drinks full is the key to a good party.
- 31 A. The worst social sin is to be rude.
B. The worst social sin is to be a bore.
- 32 A. A person should have considerable sexual experience before marriage.
B. It's better if two married persons begin their sexual experiences with each other.
- 33 A. Even if I had the money I would not care to associate with flighty persons like those in the "jet set".
B. I could conceive of myself seeking pleasures around the world with the "jet set".
- 34 A. I like people who are sharp and witty even if they do sometimes insult others.
B. I dislike people who have their fun at the expense of hurting the feelings of others.

- 35 A. There is altogether too much portrayal of sex in movies.
B. I enjoy watching many of the "sexy" scenes in movies.
- 36 A. I feel best after taking a couple of drinks.
B. Something is wrong with people who need liquor to feel good.
- 37 A. People should dress according to some standards of taste, neatness, and style.
B. People should dress in individual ways even if the effects are sometimes strange.
- 38 A. Sailing a long distance in a small sailing craft is foolhardy.
B. I would like to sail a long distance in a small but seaworthy sailing craft.
- 39 A. I have no patience with dull or boring persons.
B. I find something interesting in almost every person I talk with.
- 40 A. Skiing fast down a high mountain slope is a good way to end up on crutches.
B. I think I would enjoy the sensations of skiing very fast down a high mountain slope.

Sensation Seeking Scale Form V - Scoring Key.

SSTA : 3A, 11B, 16A, 17A, 20B, 21B, 23A, 28A, 38B, 40B

SSES : 4B, 6A, 9A, 10B, 14A, 18A, 19B, 22A, 26B, 37B

SSDis : 1A, 12B, 13B, 25B, 29A, 30B, 32A, 33B, 35B, 36A

SSBS : 2B, 5A, 7B, 8A, 15B, 24A, 27B, 31B, 34A, 39A

Score = number of critical alternatives chosen on each
subscale.

A.2 FORM M

DIRECTIONS

Listed below are statements that describe things you might do or experiences you might have. To the right of each statement you are to indicate whether you LIKE or DISLIKE the activity described by the statement. If you LIKE the activity circle L. If you DISLIKE the activity circle D. Work rapidly and give your first impressions.

- | | | |
|---|---|---|
| 1 Exploring the ruins of an old city in Mexico. | L | D |
| 2 Thinking about why people behave the way they do. | L | D |
| 3 Letting myself experience new and unusual feelings. | L | D |
| 4 Finding out how a carburettor on a car works. | L | D |
| 5 Being on a raft in the middle of the Colorado River. | L | D |
| 6 Knowing why politicians act the way they do. | L | D |
| 7 Losing myself in daydreams when I am bored with what is going on. | L | D |
| 8 Finding out the meanings of words I don't know. | L | D |
| 9 Riding on a sled in Alaska pulled by huskies. | L | D |
| 10 Trying to figure out the meaning of unusal statements. | L | D |
| 11 Letting myself experience new and unusual feelings. | L | D |
| 12 Learning about a subject I don't know much about. | L | D |
| 13 Scuba diving in the Bahamas. | L | D |
| 14 Thinking a lot about a new idea. | L | D |
| 15 Watching a red rose turn blue before my eyes. | L | D |
| 16 Learning new facts about World War II. | L | D |

- | | | | |
|----|---|---|---|
| 17 | Being at the top of a roller coaster ready to go down. | L | D |
| 18 | Thinking of different ways to explain the same thing. | L | D |
| 19 | Looking through a blue bottle and seeing people in a dark restuarant. | L | D |
| 20 | Understanding how a computer works. | L | D |
| 21 | Sleeping out under the trees and stars. | L | D |
| 22 | Thinking about unusual events or happenings. | L | D |
| 23 | Having an unusual dream in which I swam underwater for hours. | L | D |
| 24 | Visiting a factory to see how paper is made. | L | D |
| 25 | Watching a colourful bullfight in Spain. | L | D |
| 26 | Figuring out the shortest distance from one city to another. | L | D |
| 27 | Having a vivid dream with strange colours and sounds. | L | D |
| 28 | Figuring out how a light meter works. | L | D |
| 29 | Going on a safari in Africa to hunt lions. | L | D |
| 30 | Analyzing my own dreams. | L | D |
| 31 | Having a dream in which I lived in England in an old, haunted castle. | L | D |
| 32 | Seeing a glass blowing exhibition and listening to an explanation. | L | D |
| 33 | Orbiting the earth in a spaceship. | L | D |
| 34 | Figuring out why I did something. | L | D |
| 35 | Seeing a duck with the head of a cat. | L | D |
| 36 | Reading the <u>World Almanac</u> . | L | D |

37	Skiing down a high slope in the Alps.	L	D
38	Analyzing my own feelings and reactions.	L	D
39	Having a dream in which I seemed to be flying.	L	D
40	Planning moves in chess.	L	D
41	Climbing to the top of a high rugged mountain.	L	D
42	Thinking about ideas that contradict each other.	L	D
43	Dreaming that I was lying on the beach with the waves washing over me.	L	D
44	Discovering a difficult word in a crossword puzzle.	L	D
45	Riding the rapids in a swift moving stream.	L	D
46	Listening to a lecture or talk that makes me think afterwards.	L	D
47	Letting my body totally relax and seeing what I feel.	L	D
48	Solving a problem involving numbers or figures.	L	D
49	Walking into an old deserted house at midnight.	L	D
50	Reading books on subjects that stimulate me to think.	L	D
51	Feeling chills run all over my body.	L	D
52	Figuring out how much it would cost to construct a building.	L	D
53	Driving a sports car in the Indianapolis 500.	L	D
54	Seeing movies after which I think about something differently.	L	D
55	Having my feelings change from moment to moment	L	D
56	Finding out how to unlock the two pieces of a wire puzzle.	L	D

57	Diving from a board 50 feet above the water.	L	D
58	Discussing unusual ideas.	L	D
59	Having a strange new feeling as I awake in the morning.	L	D
60	Discovering the villain in a detective story before he is revealed.	L	D
61	Riding a wild horse in a rodeo.	L	D
62	Reading articles in the newspaper that provoke my thought.	L	D
63	Experiencing abrupt changes in my moods.	L	D
64	Learning how to put a watch together.	L	D
65	Steering a sled down a steep hill covered with trees.	L	D
66	Thinking about why the world is in the shape it is.	L	D
67	Experiencing my feelings intensely.	L	D
68	Putting together a complicated picture puzzle.	L	D
69	Walking across a swinging bridge over a deep gully.	L	D
70	Analyzing a theory to see if it is a good one.	L	D
71	Suddenly feeling happy for no reason at all.	L	D
72	Reading a book entitled <u>How Things Work</u> .	L	D
73	Swinging on a vine across a river filled with snakes.	L	D
74	Figuring out why some event happened the way it did.	L	D
75	Focussing inside on the flow of my feelings.	L	D
76	Figuring out how many bricks it would take to construct a fireplace.	L	D

- | | | | |
|----|---|---|---|
| 77 | Camping out in a wilderness location. | L | D |
| 78 | Starting off with a new idea and seeing the new ones suggested by the original one. | L | D |
| 79 | Having a vivid or unusual daydream as I am riding along. | L | D |
| 80 | Learning how to make pottery. | L | D |

Novelty Experiencing Scale - Scoring key

NESES:	1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77
NESIC:	2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58, 62, 66, 70, 74, 78
NESIS:	3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71, 75, 79
NESEC:	4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80

Score = number of critical items marked for each subscale.

A.3 FORM P

DIRECTIONS

To what extent do the following statements apply to you? Circle the appropriate number to the right of the statement to indicate the extent to which each statement is true for you.

	True, and typical of me	Often or sometimes true	Not true for me
1 I visit a library to read material not directly related to my class work	1	2	3
2 I would like to watch an astronomer calculate the age of a star.....	1	2	3
3 If I read something which puzzles me, I keep reading until I understand it.....	1	2	3
4 Complicated machinery is fascinating to look at.....	1	2	3
5 When I don't know the answer to a question on a test I look up the answer when the test is completed...	1	2	3
6 I read for enjoyment during a large part of my spare time.....	1	2	3
7 I am interested in mathematical procedures possible with new calculating machines.....	1	2	3
8 I like to look at pictures which are puzzling in some way.....	1	2	3
9 I read several magazines regularly..	1	2	3
10 It is interesting to try to figure out how an unusual piece of machinery works.....	1	2	3

11	Some truths can only be expressed in paradoxical statements.....	1	2	3
12	I like to look at rocks which are made of many kinds of minerals ...	1	2	3
13	I have had experiences which inspired me to write a poem or story, make up a humorous tale or paint a picture.....	1	2	3
14	I think about how strange plants grow.....	1	2	3
15	At times I have focussed on something so hard that I went into a kind of benumbed state of consciousness, and at other times into a state of extraordinary calm and serenity.....	1	2	3
16	If I come across something interesting I drop everything and study it, it is never a waste of time.....	1	2	3

Test of Intrinsic Motivation - Scoring key

Score = sum of rating circled for each item.

A.4 FORM R

DIRECTIONS

On the following pages are statements describing your attitudes in different situations. Read each statement carefully and decide whether or not it is true for you.

If a statement is TRUE or MOSTLY TRUE circle the T which appears to the right of the statement. If the statement is NOT TRUE or NOT USUALLY TRUE circle the F which appears to the right of the statement.

Do not spend too much time on any one statement and do not omit any items.

- | | | | |
|----|--|---|---|
| 1 | I must admit I am interested in and keep watching an individual whose personality is not obvious to me | T | F |
| 2 | I wish people would explain how all the different instruments in an orchestra sound so well together | T | F |
| 3 | I try to think of answers to the problems of international social relationships | T | F |
| 4 | If I were to see a new national park I would try to find out about it from other people | T | F |
| 5 | We ought to let the rest of the world solve their own problems and just look after ourselves..... | T | F |
| 6 | I enjoy trying to identify old themes in new songs..... | T | F |
| 7 | I often think about how strange plants grow..... | T | F |
| 8 | I like meeting people who give me new ideas..... | T | F |
| 9 | I read any magazine that reports new scientific discoveries..... | T | F |
| 10 | I would never want to do research in methods of doing arithmetic problems..... | T | F |
| 11 | When I hear an instrument and I am not sure what it is, I like to see it..... | T | F |

12	I soon get bored when there is not enough going on.....	T	F
13	If an arithmetic problem has several different solutions, I try to look at them all.....	T	F
14	When I see a foreign car, I associate it with the country it is from.....	T	F
15	I believe people tell lies any time it is to their advantage.....	T	F
16	I like to watch all the musicians in an orchestra playing together.....	T	F
17	I appreciate a novel with a lot of characters because I like keeping track of them.....	T	F
18	I used to ask lots of questions in science class.....	T	F
19	I would rather talk to people of different opinions than to people who agree with me.....	T	F
20	When I am given a new kind of problem in arithmetic, I like to think about how it might be solved.....	T	F
21	If I worked in a factory, I would like to find out everything that is going on.....	T	F
22	I like visiting art galleries.....	T	F
23	I would rather spend time solving one difficult arithmetic problem, than spend it with a lot of easy ones.....	T	F
24	Simple explanations of international issues leave a lot of questions in my mind.....	T	F
25	I like to go somewhere different nearly every day.....	T	F
26	I am not interested in the maths procedures possible with new calculating machines.....	T	F
27	If the story in a book is very complicated I find it hard to put the book down until I have figured everything out.....	T	F
28	I always try to be considerate of the feelings of my friends.....	T	F
29	I would like to watch an astronomer calculate the age of a star.....	T	F

- | | | | |
|----|---|---|---|
| 30 | I would like to ask a computer programmer to explain some of the theory he uses in his work..... | T | F |
| 31 | I would like to watch a draftsman draw the lay-out plans for a large office building..... | T | F |
| 32 | I would like to understand how complicated things like watches work..... | T | F |
| 33 | I like to discuss most social issues with different people to get many different views..... | T | F |
| 34 | If I saw some spectacular scientific feat on TV, it would make me want to ask many questions..... | T | F |
| 35 | It is fun to think up ideas that would be good sales promotions..... | T | F |
| 36 | It is fascinating to learn how mountains are created..... | T | F |
| 37 | I like to guess what people are thinking from the expression on their faces..... | T | F |
| 38 | I am not willing to give up my own privacy or pleasure in order to help other people..... | T | F |
| 39 | I would like to watch geologists identify different kinds of minerals in rocks..... | T | F |
| 40 | If I read something which puzzles me, I keep reading it until I understand it..... | T | F |
| 41 | When I choose a book to read I look for an author with something new in his approach..... | T | F |
| 42 | I would look at all the possible brands and models before buying an appliance..... | T | F |
| 43 | I like to read..... | T | F |
| 44 | I would like to know something about music of the 16th century..... | T | F |
| 45 | I like movie previews..... | T | F |
| 46 | I would rather visit a park I have never seen before than one I knew well..... | T | F |
| 47 | I like to reflect on the strange behavioral patterns of wildlife animals..... | T | F |

- | | | | |
|----|---|---|---|
| 48 | I would be particularly attracted to an art display featuring many interpretations of a single theme..... | T | F |
| 49 | It is fascinating to look at new machines..... | T | F |
| 50 | If I see a crowd, I want to ask someone what is happening..... | T | F |
| 51 | If I met an art expert, I would immediately ask him about "op" and "pop" art..... | T | F |
| 52 | I like to look at rocks which are made up of many kinds of minerals..... | T | F |
| 53 | My memory is as good as other people's..... | T | F |
| 54 | When I hear a new song on the radio I would like to phone the station to get its name..... | T | F |
| 55 | When I see an unusual plant I wish a naturalist were around so I could ask him questions..... | T | F |
| 56 | I like to eat the same kind of food most of the time.. | T | F |
| 57 | If I come across a new word I try to look it up in the dictionary..... | T | F |
| 58 | If I were reading a travel book I would keep a map beside me..... | T | F |
| 59 | If I see a tool which is a little different from ones I know, I like to ask someone what it is for..... | T | F |
| 60 | I get tired of doing the same thing all the time..... | T | F |
| 61 | When a problem appears to have several possible approaches I have to solve it before I go to something else. | T | F |
| 62 | I would like to ask a banker how he keeps track of everyone's account..... | T | F |
| 63 | I like to touch and feel a sculpture..... | T | F |
| 64 | I would like to inspect a platypus' habitat..... | T | F |
| 65 | If I make a new friend I like to ask him all sorts of questions..... | T | F |
| 66 | I avoid busy, noisy places..... | T | F |
| 67 | I like to look at pictures which are puzzling in some way..... | T | F |

- 68 I am always glad to have someone visit me..... T F
- 69 If I find a word I don't understand, I try to figure out its meaning..... T F
- 70 When I am waiting for my appointment in an office, I try to identify the occupations of the staff I can see T F
- 71 I never spend any time alone if I can help it..... T F
- 72 I am always thinking up subtle ways of getting people to change their minds..... T F
- 73 When I can only hear some of the words of a song, I try to piece it together..... T F
- 74 In the long run, humanity will owe a lot more to the teacher than to the salesman..... T F
- 75 A painting which could represent many different things makes me think a lot more than an obvious one..... T F
- 76 I would question owners of many different brands and models before buying an appliance..... T F
- 77 When I read conflicting reports about an incident in the newspaper I would like to find out what really happened..... T F
- 78 If I read about a new product in a magazine, I want to find out all about it..... T F
- 79 Whenever I visit a library I want to ask about the filing system for classifying books..... T F
- 80 I would like to ask a musical conductor what all his hand movements mean..... T F
- 81 If I hear something rustling in the grass I have to see what it is..... T F
- 82 I would like to study the relationships which unite the physical sciences..... T F
- 83 I notice any new storage system coming on the market which would help me organize my belongings..... T F
- 84 I wonder why things like mushrooms are considered plants, since they aren't green like other plants..... T F
- 85 I find it very difficult to concentrate..... T F
- 86 I like to tinker with complicated machinery..... T F

87	I try to think of new ways to interpret classical art.	T	F
88	It is fascinating to see how computers work.....	T	F
89	When I see a complicated piece of machinery, I like to ask someone how it works.....	T	F
90	When I see a vocal performance, I always try to associate the different voice types with different members of the group.....	T	F
91	To me, the outdoors is the wild, little known country with many features to investigate.....	T	F
92	I feel better if I ask someone to explain an abstract piece of art.....	T	F
93	I would like to think up new ways to entertain patients in hospitals.....	T	F
94	A painting is more interesting to me if I can study it before having it interpreted.....	T	F
95	Many things make me feel uneasy.....	T	F
96	It is interesting to try to figure out how an unusual piece of machinery works.....	T	F
97	I like a place better the more I am around it.....	T	F
98	Whenever I have correspondence with some company official, I feel I would like to meet him.....	T	F
99	I ask questions about the people I meet until I feel I know what they are like.....	T	F
100	I often feel restless.....	T	F
101	I would like to think up sales promotions for really complicated products.....	T	F
102	I would like to ask a dietitian about some contradictory facts pertaining to fat and skinny people.....	T	F
103	I often wonder how they set up new office systems.....	T	F
104	I like to have lots of activity around me.....	T	F
105	I could think about an arithmetic puzzle for a long time.....	T	F

106	I often speculate about the probable appearance of other planets.....	T	F
107	A poem gives me more to think about than a short story.	T	F
108	Complicated machinery is fascinating to look at.....	T	F
109	My life is full of interesting activities.....	T	F
110	I am able to make correct decisions on difficult questions.....	T	F

Ontario Test of Intrinsic Motivation - Scoring key

OTIMSC:	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 55, 57, 58, 59, 61, 62, 63, 64, 65, 67, 69, 70, 72, 73, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 86, 87, 88, 89, 90, 91, 92, 93, 94, 96, 98, 99, 101, 102, 103, 105, 106, 107, 108	- TRUE
	10, 26,	- FALSE
OTIMDC:	12, 25, 60, 68, 71, 100, 104	- TRUE
	56, 66, 97	- FALSE
OTIMSD:	28, 53, 74, 109, 110	- TRUE
	5, 15, 38, 85, 95	- FALSE

Score = number of items marked in the keyed direction.

Following Russell and Glow (1975) minor wording changes were made to three items of the OTIM to suit the Australian context.

- No. 3 "nature trail" was changed to "national park"
- No. 26 "math" was changed to "maths"
- No. 64 "beaver" was changed to "platypus"

A.5 FORM S

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel.

There are no right or wrong answers.
Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost never	Sometimes	Often	Almost always
1 I think life is interesting and exciting	1	2	3	4
2 I am curious about things	1	2	3	4
3 I enjoy taking things apart to "see what makes them tick"	1	2	3	4
4 I feel involved in what I am doing	1	2	3	4
5 I find interesting things to do in my spare time.	1	2	3	4
6 I am intrigued by presents and gifts, even when they are not for me	1	2	3	4
7 I want to probe deeply into things	1	2	3	4
8 I enjoy exploring new areas, even if I get lost .	1	2	3	4
9 I feel active	1	2	3	4
10 New situations capture my attention	1	2	3	4
11 I feel inquisitive	1	2	3	4

12 I feel like asking questions about what is happening	1	2	3	4
13 The prospect of learning new things excites me ..	1	2	3	4
14 I feel like searching for answers	1	2	3	4
15 I feel absorbed in things I do	1	2	3	4
16 I like speculating about things	1	2	3	4
17 I like to experience new sensations	1	2	3	4
18 I feel interested in things	1	2	3	4
19 I like to enquire about things I don't understand	1	2	3	4
20 I feel like seeking things out	1	2	3	4

Melbourne Curiosity Inventory Trait Form - Scoring key

Score = Sum of rating circled for each item.

APPENDIX B
DISTRIBUTION OF ACER AL-AQ SCORES

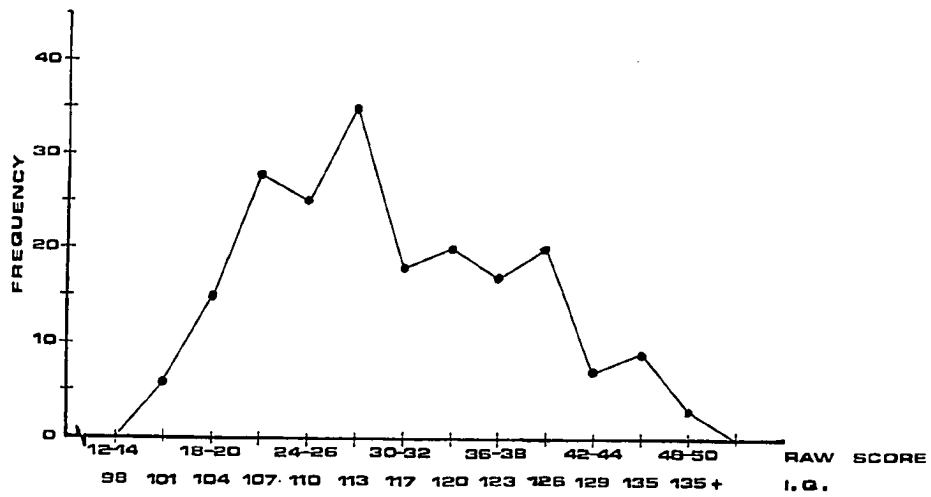


Figure B.1 Distribution of ACER AL-AQ scores: Study 6.1

APPENDIX C
MEANS AND STANDARD DEVIATIONS FOR CURIOSITY SCALES

Table C.1
Means and Standard Deviations: Curiosity Scales

Scale	<u>M</u>	<u>SD</u>	<u>n</u> ^a
SSTA	6.64	2.42	226
SSES	5.59	2.05	225
SSD _{is}	4.58	2.41	223
SSBS	3.47	2.03	223
NESES	12.21	4.70	222
NESIC	14.32	4.78	222
NESIS	13.03	4.57	218
NESEC	11.45	4.68	227
IM	32.02	5.50	221
OTIMSC	50.85	12.98	213
OTIMDC	5.86	1.78	219
OTIMSD	5.38	1.34	219
MCIT	57.94	8.74	227

^aSome incomplete test forms.

APPENDIX D

ACER AL-AQ CORRELATIONS WITH CURIOSITY SCORES

Table D.1
Correlation Coefficients:
AL-AQ with Curiosity Scales (N = 171)

Scale	<u>r</u>
SSTA	14
SSES	21*
SSDis	14
SSBS	08
NESES	06
NESIC	10
NESIS	09
NESEC	13
IM	07
OTIMSC	00
OTIMDC	06
OTIMSD	01
MCIT	01

Note. Decimal points omitted.

* $p < .001$.

APPENDIX E
FACTOR ANALYSIS TABLES: STUDY 6.1

- Table E.1 Correlation Matrix: Curiosity Scales
Table E.2 Principal Factors Table: Curiosity Scales
Table E.3 Varimax Rotation of Three Factors: Curiosity
Scales.

Table E.1
Correlation Matrix: Curiosity Scales

	SSTAS	SSES	SSOIS	SSBS	NESES	MESIC	MESIS	NESEC	IM	OTIMSC
SSTAS	1.00000									
SSES	.52355	1.00000								
SSOIS	.16918	.43618	1.00000							
SSBS	.11124	.29471	.34635	1.00000						
NESES	.64364	.24269	.17535	.15745	1.00000					
MESIC	.07106	.22884	.07013	-.16322	.23202	1.00000				
MESIS	.25974	.34567	.29397	.04802	.43984	.56699	1.00000			
NESEC	.12340	.07723	-.03161	-.13973	.17204	.59398	.37222	1.00000		
IM	.15647	.26896	-.09078	-.07560	.16339	.47962	.23568	.68634	1.00000	
OTIMSC	.32714	.31085	.12286	.32459	.36189	.44508	.32829	.53188	.00001	1.00000
OTIMOC	.14842	.23962	.18711	.24617	.16375	.04333	.12662	-.08609	-.167623	.69180
OTIMSO	-.01003	.05192	-.15397	-.12597	.09161	.16727	.34073	.27111	-.22515	.33618
TRAITC	.09315	.28498	-.03914	.11732	.19323	.43878	.29268	.29968	.51821	.44037

	OTIMSO	TRAITC
SSTAS	.14842	.09315
SSES	.23962	.28498
SSOIS	.18711	-.03914
SSBS	.24617	.11732
NESES	.16375	.19323
MESIC	.04333	.43878
MESIS	.12662	.29268
NESEC	-.08609	.29968
IM	.167623	.51821
OTIMSC	.69180	.44037
OTIMOC	.33618	.30177
OTIMSO	1.00000	.24051
TRAITC	.44037	1.00000

Note. The MCIT scale is listed here as TRAITC.

Table E.2
Principal Factors Table: Curiosity Scales

VARIABLE	EST COMMUNALITY	FACTOR	=IGENVALUE	PCT OF VAR	CUM PCT
SSTAS	.49483	1	3.50242	29.2	29.2
SSES	.39614	2	2.25598	17.2	46.4
SSDIS	.32823	3	1.18874	9.1	55.6
SSBS	.19573	4	.96630	7.4	63.0
NESES	.53343	5	.86419	6.6	69.6
NESIC	.57202	6	.81444	6.3	75.9
NESIS	.48444	7	.72589	5.6	81.5
NESEC	.57848	8	.63749	5.4	86.8
IM	.56494	9	.47704	3.7	90.5
OTIMSC	.52536	10	.35774	3.1	93.5
OIIMDC	.15137	11	.34757	2.7	96.2
OTINSD	.18400	12	.27660	2.1	98.4
TRAITC	.38889	13	.21081	1.6	100.0

Note. The MCIT scale is listed here as TRAITC.

Table E.3
 Varimax Rotation of Three Factors^a: Curiosity Scales

Scale	Rotated Factors ^b		
	1	2	3
SSTA	10	19	76
SSES	29	57	19
SSDis	01	67	06
SSBS	-12	45	08
NESES	15	21	78
NESIC	72	13	00
NESIS	39	37	25
NESEC	73	-17	10
IM	77	-03	09
OTIMSC	70	11	27
OTIMDC	-03	38	11
OTIMSD	36	-19	00
MCIT	58	11	07

Note. Decimal points omitted.

^aThese three factors accounted for 55.5% of the total variance.

^bValues >.29 have been entered in **bold** type.

APPENDIX F
ORIGINAL SCALES AND ITEM/FACTOR SCORE
CORRELATIONS

Scales:

- F.1 Sensation Seeking Scale
- F.2 Novelty Experiencing Scale
- F.3 Test of Intrinsic Motivation
- F.4 Ontario Test of Intrinsic Motivation
- F.5 Melbourne Curiosity Inventory - Trait Form

F.1

Sensation Seeking Scale: Item/Factor Score Correlations

	F1	F2
1 A. I like "wild" uninhibited parties.	.17	.25
B. I prefer quiet parties with good conversation.		
2 A. There are some movies I enjoy seeing a second or even a third time.	.10	.03
B. I can't stand watching a movie that I've seen before.		
3 A. I often wish I could be a mountain climber.	.14	.32
B. I can't understand people who risk their necks climbing mountains.		
4 A. I dislike all body odours.	.18	.31
B. I like some of the earthy body smells.		
5 A. I get bored seeing the same old faces everyday.	.04	.20
B. I like the comfortable familiarity of everyday friends.		
6 A. I like to explore a strange city or section of town by myself, even if it means getting lost.	.24	.35
B. I prefer a guide when I am in a place I don't know well.		
7 A. I dislike people who do or say things just to shock or upset others.	.05	.09
B. When you can predict almost everything a person will do and say he or she must be a bore.		
8 A. I usually don't enjoy a movie or play where I can predict what will happen in advance.	.07	.13
B. I don't mind watching a movie or play where I can predict what will happen in advance.		
9 A. I have tried marijuana or would like to.	.00	.44
B. I would never smoke marijuana.		
10 A. I would not like to try any drug which might produce strange and dangerous effects on me.	.07	.24
B. I would like to try some of the new drugs that produce hallucinations.		
11 A. A sensible person avoids activities that are dangerous.	.19	.48
B. I sometimes like to do things that are a little frightening.		

		F1	F2
12	A. I dislike "swingers". B. I enjoy the company of real "swingers".	.03	.34
13	A. I find that stimulants make me uncomfortable. B. I often like to get high (drinking liquor or smoking marijuana).	.11	.45
14	A. I like to try new foods that I have never tasted before. B. I order the dishes with which I am familiar, so as to avoid disappointment and unpleasantness.	.16	.35
15	A. I enjoy looking at home movies or travel slides. B. Looking at someone's home movies or travel slides bores me tremendously.	.21	.26
16	A. I would like to take up the sport of water-skiing. B. I would not like to take up water-skiing.	.03	.42
17	A. I would like to try surf-board riding. B. I would not like to try surf-board riding.	.08	.48
18	A. I would like to take off on a trip with no pre-planned or definite routes, or timetable. B. When I go on a trip I like to plan my route and timetable fairly carefully.	.18	.50
19	A. I prefer the "down-to-earth" kinds of people as friends. B. I would like to make friends in some of the "far-out" groups like artists or "hippies".	.09	.32
20	A. I would not like to learn to fly an aeroplane. B. I would like to learn to fly an aeroplane.	.01	.07
21	A. I prefer the surface of the water to the depths. B. I would like to go scuba diving.	.17	.48
22	A. I would like to meet some persons who are homosexual (men or women). B. I stay away from anyone I suspect of being "queer".	.18	.31
23	A. I would like to try parachute jumping. B. I would never want to try jumping out of a plane with or without a parachute.	.07	.33
24	A. I prefer friends who are excitingly unpredictable. B. I prefer friends who are reliable and predictable.	.15	.38

		F1	F2
25	A. I am not interested in experience for its own sake. B. I like to have new and exciting experiences and sensations even if they are a little frightening, unconventional or illegal.	.21	.53
26	A. The essence of good art is in its clarity, symmetry of form and harmony of colours. B. I often find beauty in the "clashing" colours and irregular forms of modern painting.	.07	.17
27	A. I enjoy spending time in the familiar surroundings of home. B. I get very restless if I have to stay around home for any length of time.	.23	.32
28	A. I like to dive off the high board. B. I don't like the feeling I get standing on the high board (or I don't go near it at all).	.10	.28
29	A. I like to date members of the opposite sex who are physically exciting. B. I like to date members of the opposite sex who share my values.	.07	.29
30	A. Heavy drinking usually ruins a party because some people get loud and boisterous. B. Keeping the drinks full is the key to a good party.	.13	.30
31	A. The worst social sin is to be rude. B. The worst social sin is to be a bore.	.03	.31
32	A. A person should have considerable sexual experience before marriage. B. It's better if two married persons begin their sexual experiences with each other.	.01	.32
33	A. Even if I had the money I would not care to associate with flighty persons like those in the "jet set". B. I could conceive of myself seeking pleasures around the world with the "jet set".	.03	.16
34	A. I like people who are sharp and witty even if they do sometimes insult others. B. I dislike people who have their fun at the expense of hurting the feelings of others.	.11	.30
35	A. There is altogether too much portrayal of sex in movies. B. I enjoy watching many of the "sexy" scenes in movies.	.00	.29

	F1	F2
36 A. I feel best after taking a couple of drinks.	.10	.31
B. Something is wrong with people who need liquor to feel good.		
37 A. People should dress according to some standards of taste, neatness, and style.	.06	.30
B. People should dress in individual ways even if the effects are sometimes strange.		
38 A. Sailing a long distance in a small sailing craft is foolhardy.	.15	.29
B. I would like to sail a long distance in a small but seaworthy sailing craft.		
39 A. I have no patience with dull or boring persons.	.25	.10
B. I find something interesting in almost every person I talk with.		
40 A. Skiing fast down a high mountain slope is a good way to end up on crutches.	.09	.43
B. I think I would enjoy the sensations of skiing very fast down a high mountain slope.		

F.2

Novelty Experiencing Scale: Item/Factor Score Correlations

	F1	F2
1 Exploring the ruins of an old city in Mexico.	.23	.18
2 Thinking about why people behave the way they do.	.33	.09
3 Letting myself experience new and unusual feelings.	.29	.24
4 Finding out how a carburettor on a car works.	.28	.05
5 Being on a raft in the middle of the Colorado River.	.02	.52
6 Knowing why politicians act the way they do.	.37	.03
7 Losing myself in daydreams when I am bored with what is going on.	.05	.12
8 Finding out the meanings of words I don't know.	.38	.06
9 Riding on a sled in Alaska pulled by huskies.	.20	.43
10 Trying to figure out the meaning of unusal statements.	.52	.07
11 Letting myself experience new and unusual feelings.	.25	.28
12 Learning about a subject I don't know much about.	.43	.14
13 Scuba diving in the Bahamas.	.04	.60
14 Thinking a lot about a new idea.	.30	.14
15 Watching a red rose turn blue before my eyes.	.19	.19
16 Learning new facts about World War II.	.33	.06
17 Being at the top of a roller coaster ready to go down.	.06	.26
18 Thinking of different ways to explain the same thing.	.51	.03
19 Looking through a blue bottle and seeing people in a dark restuarant.	.29	.24
20 Understanding how a computer works.	.45	.01

	F1	F2
21 Sleeping out under the trees and stars.	.17	.34
22 Thinking about unusual events or happenings.	.40	.24
23 Having an unusual dream in which I swam underwater for hours.	.30	.40
24 Visiting a factory to see how paper is made.	.43	.13
25 Watching a colourful bullfight in Spain.	.12	.16
26 Figuring out the shortest distance from one city to another.	.43	.19
27 Having a vivid dream with strange colours and sounds.	.24	.46
28 Figuring out how a light meter works.	.62	.02
29 Going on a safari in Africa to hunt lions.	.16	.34
30 Analyzing my own dreams.	.32	.25
31 Having a dream in which I lived in England in an old, haunted castle.	.17	.39
32 Seeing a glass blowing exhibition and listening to an explanation.	.34	.30
33 Orbiting the earth in a spaceship.	.19	.43
34 Figuring out why I did something.	.32	.07
35 Seeing a duck with the head of a cat.	.09	.24
36 Reading the <u>World Almanac</u> .	.46	.03
37 Skiing down a high slope in the Alps.	.11	.37
38 Analyzing my own feelings and reactions.	.37	.21
39 Having a dream in which I seemed to be flying.	.22	.34
40 Planning moves in chess.	.40	.05

	F1	F2
41 Climbing to the top of a high rugged mountain.	.19	.26
42 Thinking about ideas that contradict each other.	.53	.07
43 Dreaming that I was lying on the beach with the waves washing over me.	.14	.36
44 Discovering a difficult word in a crossword puzzle.	.37	.02
45 Riding the rapids in a swift moving stream.	.07	.50
46 Listening to a lecture or talk that makes me think afterwards.	.43	.02
47 Letting my body totally relax and seeing what I feel.	.18	.25
48 Solving a problem involving numbers or figures.	.42	.01
49 Walking into an old deserted house at midnight.	.06	.36
50 Reading books on subjects that stimulate me to think.	.33	.06
51 Feeling chills run all over my body.	.15	.39
52 Figuring out how much it would cost to construct a building.	.41	.14
53 Driving a sports car in the Indianapolis 500.	.10	.14
54 Seeing movies after which I think about something differently.	.28	.36
55 Having my feelings change from moment to moment.	.21	.13
56 Finding out how to unlock the two pieces of a wire puzzle.	.45	.24
57 Diving from a board 50 feet above the water.	.08	.11
58 Discussing unusual ideas.	.40	.28
59 Having a strange new feeling as I awake in the morning.	.18	.14
60 Discovering the villain in a detective story before he is revealed.	.18	.34

	F1	F2
61 Riding a wild horse in a rodeo.	.19	.33
62 Reading articles in the newspaper that provoke my thought.	.38	.08
63 Experiencing abrupt changes in my moods.	.20	.27
64 Learning how to put a watch together.	.59	.09
65 Steering a sled down a steep hill covered with trees.	.22	.39
66 Thinking about why the world is in the shape it is.	.50	.03
67 Experiencing my feelings intensely.	.22	.28
68 Putting together a complicated picture puzzle.	.46	.11
69 Walking across a swinging bridge over a deep gully.	.16	.40
70 Analyzing a theory to see if it is a good one.	.51	.04
71 Suddenly feeling happy for no reason at all.	.12	.07
72 Reading a book entitled <u>How Things Work</u> .	.58	.07
73 Swinging on a vine across a river filled with snakes.	.03	.19
74 Figuring out why some event happened the way it did.	.49	.04
75 Focussing inside on the flow of my feelings.	.44	.22
76 Figuring out how many bricks it would take to construct a fireplace.	.52	.03
77 Camping out in a wilderness location.	.17	.46
78 Starting off with a new idea and seeing the new ones suggested by the original one.	.47	.14
79 Having a vivid and unusual daydream as I am riding along.	.19	.26
80 Learning how to make pottery.	.28	.11

F.3

Test of Intrinsic Motivation: Item/Factor Score Correlations

	F1	F2
1 I visit a library to read material not directly related to my class work42	-.06
2 I would like to watch an astronomer calculate the age of a star.....	.51	-.01
3 If I read something which puzzles me, I keep reading until I understand it.....	.49	-.04
4 Complicated machinery is fascinating to look at.....	.55	-.08
5 When I don't know the answer to a question on a test I look up the answer when the test is completed.....	.37	-.04
6 I read for enjoyment during a large part of my spare time.....	.25	-.14
7 I am interested in mathematical procedures possible with new calculating machines.....	.48	.04
8 I like to look at pictures which are puzzling in some way.....	.47	.14
9 I read several magazines regularly.....	.07	.04
10 It is interesting to try to figure out how an unusual piece of machinery works.....	.53	-.08
11 Some truths can only be expressed in paradoxical statements.....	.46	.11
12 I like to look at rocks which are made of many kinds of minerals.....	.50	.04
13 I have had experiences which inspired me to write a poem or story, make up a humorous tale or paint a picture.....	.32	.09
14 I think about how strange plants grow.....	.41	.03
15 At times I have focussed on something so hard that I went into a kind of benumbed state of consciousness, and at other times into a state of extraordinary calm and serenity.....	.34	.30
16 If I come across something interesting I drop everything and study it, it is never a waste of time...	.53	.12

F.4

Ontario Test of Intrinsic Motivation: Item/Factor Score Correlations

Note. Items for which the response FALSE is scored are marked with F.

	F1	F2
1 I must admit I am interested in and keep watching an individual whose personality is not obvious to me25	.20
2 I wish people would explain how all the different instruments in an orchestra sound so well together21	.09
3 I try to think of answers to the problems of international social relationships35	.18
4 If I were to see a new national park I would try to find out about it from other people22	.12
5 We ought to let the rest of the world solve their own problems and just look after ourselves.....	.20	-.08
F		
6 I enjoy trying to identify old themes in new songs.....	.23	.02
7 I often think about how strange plants grow.....	.27	.17
8 I like meeting people who give me new ideas.....	.17	.19
9 I read any magazine that reports new scientific discoveries.....	.34	.11
10 I would never want to do research in methods of doing arithmetic problems.....	.13	-.03
F		
11 When I hear an instrument and I am not sure what it is, I like to see it.....	.22	.03
12 I soon get bored when there is not enough going on.....	.14	.22
13 If an arithmetic problem has several different solutions, I try to look at them all.....	.31	.13
14 When I see a foreign car, I associate it with the country it is from.....	.05	.17
15 I believe people tell lies any time it is to their advantage.....	.11	-.16
F		

	F1	F2
16 I like to watch all the musicians in an orchestra playing together.....	.37	.02
17 I appreciate a novel with a lot of characters because I like keeping track of them.....	.17	.14
18 I used to ask lots of questions in science class.....	.26	.10
19 I would rather talk to people of different opinions than to people who agree with me.....	.16	.11
20 When I am given a new kind of problem in arithmetic, I like to think about how it might be solved.....	.26	.10
21 If I worked in a factory, I would like to find out everything that is going on.....	.21	.07
22 I like visiting art galleries.....	.28	.07
23 I would rather spend time solving one difficult arithmetic problem, than spend it with a lot of easy ones.....	.28	.16
24 Simple explanations of international issues leave a lot of questions in my mind.....	.28	.23
25 I like to go somewhere different nearly every day.....	-.06	.36
26 I am not interested in the maths procedures possible with new calculating machines.....	.27	-.04
F		
27 If the story in a book is very complicated I find it hard to put the book down until I have figured everything out.....	.26	-.01
28 I always try to be considerate of the feelings of my friends.....	.02	-.03
29 I would like to watch an astronomer calculate the age of a star.....	.44	.13
30 I would like to ask a computer programmer to explain some of the theory he uses in his work.....	.38	.04
31 I would like to watch a draftsman draw the lay-out plans for a large office building.....	.32	-.01
32 I would like to understand how complicated things like watches work.....	.44	.12

	F1	F2
33 I like to discuss most social issues with different people to get many different views.....	.41	.16
34 If I saw some spectacular scientific feat on TV, it would make me want to ask many questions.....	.35	.13
35 It is fun to think up ideas that would be good sales promotions.....	.04	.24
36 It is fascinating to learn how mountains are created.....	.36	.06
37 I like to guess what people are thinking from the expression on their faces.....	.23	.22
38 I am not willing to give up my own privacy or pleasure in order to help other people.....	.18	-.06
F		
39 I would like to watch geologists identify different kinds of minerals in rocks.....	.47	.06
40 If I read something which puzzles me, I keep reading it until I understand it.....	.24	.02
41 When I choose a book to read I look for an author with something new in his approach.....	.24	.12
42 I would look at all the possible brands and models before buying an appliance.....	.20	.02
43 I like to read.....	.12	-.08
44 I would like to know something about music of the 16th century.....	.33	.02
45 I like movie previews.....	.02	.14
46 I would rather visit a park I have never seen before than one I knew well.....	.03	.21
47 I like to reflect on the strange behavioral patterns of wildlife animals.....	.30	.15
48 I would be particularly attracted to an art display featuring many interpretations of a single theme.....	.43	.22
49 It is fascinating to look at new machines.....	.35	.18
50 If I see a crowd, I want to ask someone what is happening.....	.03	.13

	F1	F2
51 If I met an art expert, I would immediately ask him about "op" and "pop" art.....	.12	.06
52 I like to look at rocks which are made up of many kinds of minerals.....	.43	.00
53 My memory is as good as other people's.....	.08	-.06
54 When I hear a new song on the radio I would like to phone the station to get its name.....	.10	.16
55 When I see an unusual plant I wish a naturalist were around so I could ask him questions.....	.43	.03
56 I like to eat the same kind of food most of the time..	.20	.22
57 If I come across a new word I try to look it up in the dictionary.....	.26	.19
58 If I were reading a travel book I would keep a map beside me.....	.17	.04
59 If I see a tool which is a little different from ones I know, I like to ask someone what it is for.....	.29	.04
60 I get tired of doing the same thing all the time.....	.00	.20
61 When a problem appears to have several possible approaches I have to solve it before I go on to anything else.....	.33	-.02
62 I would like to ask a banker how he keeps track of everyone's account.....	.16	.05
63 I like to touch and feel a sculpture.....	.33	.25
64 I would like to inspect a platypus' habitat.....	.31	-.01
65 If I make a new friend I like to ask him all sorts of questions.....	.06	.11
66 I avoid busy, noisy places.....	.05	.26
F		
67 I like to look at pictures which are puzzling in some way.....	.29	.17
68 I am always glad to have someone visit me.....	.01	.06
69 If I find a word I don't understand, I try to figure out its meaning.....	.29	-.01

	F1	F2
70 When I am waiting for my appointment in an office, I try to identify the occupations of the staff I can see	.21	.12
71 I never spend any time alone if I can help it.....	-.13	.12
72 I am always thinking up subtle ways of getting people to change their minds.....	-.02	.21
73 When I can only hear some of the words of a song, I try to piece it together.....	.12	.19
74 In the long run, humanity will owe a lot more to the teacher than to the salesman.....	.21	-.06
75 A painting which could represent many different things makes me think a lot more than an obvious one.....	.13	.16
76 I would question owners of many different brands and models before buying a appliance.....	.23	.00
77 When I read conflicting reports about an incident in the newspaper I would like to find out what really happened.....	.27	.04
78 If I read about a new product in a magazine, I want to find out all about it.....	.06	.13
79 Whenever I visit a library I want to ask about the filing system for classifying books.....	.27	.02
80 I would like to ask a musical conductor what all his hand movements mean.....	.39	.02
81 If I hear something rustling in the grass I have to see what it is.....	.21	.09
82 I would like to study the relationships which unite the physical sciences.....	.41	.22
83 I notice any new storage system coming on the market which would help me organize my belongings.....	.13	.04
84 I wonder why things like mushrooms are considered plants, since they aren't green like other plants.....	.26	.15
85 I find it very difficult to concentrate.....	.30	-.22
F		
86 I like to tinker with complicated machinery.....	.13	.17
87 I try to think of new ways to interpret classical art.	.35	.14

	F1	F2
88 It is fascinating to see how computers work.....	.36	.11
89 When I see a complicated piece of machinery, I like to ask someone how it works.....	.40	.15
90 When I see a vocal performance, I always try to associate the different voice types with different members of the group.....	.12	.16
91 To me, the outdoors is the wild, little known country with many features to investigate.....	.04	.11
92 I feel better if I ask someone to explain an abstract piece of art.....	.04	-.01
93 I would like to think up new ways to entertain patients in hospitals.....	.15	.10
94 A painting is more interesting to me if I can study it before having it interpreted.....	.37	.03
95 Many things make me feel uneasy..... F	.30	.10
96 It is interesting to try to figure out how an unusual piece of machinery works.....	.31	.20
97 I like a place better the more I am around it..... F	.07	.04
98 Whenever I have correspondence with some company official, I feel I would like to meet him.....	.16	.09
99 I ask questions about the people I meet until I feel I know what they are like.....	.16	.32
100 I often feel restless.....	-.11	.32
101 I would like to think up sales promotions for really complicated products.....	.13	.33
102 I would like to ask a dietitian about some contradictory facts pertaining to fat and skinny people.....	.21	.13
103 I often wonder how they set up new office systems.....	.26	.05
104 I like to have lots of activity around me.....	.10	.19
105 I could think about an arithmetic puzzle for a long time.....	.43	.06

106 I often speculate about the probable appearance of other planets.....	.15	.18
107 A poem gives me more to think about than a short story.	.19	.14
108 Complicated machinery is fascinating to look at.....	.47	.15
109 My life is full of interesting activities.....	.07	.01
110 I am able to make correct decisions on difficult questions.....	.19	.15

F.5

Melbourne Curiosity Inventory - Trait Form: Item/Factor ScoreCorrelations

	F1	F2
1 I think life is interesting and exciting26	-.05
2 I am curious about things48	.17
3 I enjoy taking things apart to "see what makes them tick"47	.14
4 I feel involved in what I am doing27	-.01
5 I find interesting things to do in my spare time.	.30	-.08
6 I am intrigued by presents and gifts, even when they are not for me11	.12
7 I want to probe deeply into things48	.14
8 I enjoy exploring new areas, even if I get lost .	.33	.32
9 I feel active06	.15
10 New situations capture my attention40	.20
11 I feel inquisitive40	.29
12 I feel like asking questions about what is happening39	.08
13 The prospect of learning new things excites me ..	.57	.07
14 I feel like searching for answers55	.01
15 I feel absorbed in things I do27	-.05
16 I like speculating about things38	.07
17 I like to experience new sensations20	.29
18 I feel interested in things39	.02
19 I like to enquire about things I don't understand	.55	.06
20 I feel like seeking things out.....	.44	.09

APPENDIX G
42 ITEM SCALE

Below is a set of statements describing certain activities and experiences. Read each statement and then circle that number to the right of the statement which indicates the extent to which you would like that type of activity or experience.

There are no right or wrong answers. Do not spend too much time on any one statement.

	Do not like at all	Probably dislike	Probably like	Like very much
1 Steering a sled down a steep hill covered with trees..	1	2	3	4
2 Thinking of different ways to explain the same thing.	1	2	3	4
3 Taking up the sport of water-skiing.....	1	2	3	4
4 Figuring out why some event happened the way it did..	1	2	3	4
5 Riding the rapids in a swift moving stream	1	2	3	4
6 Starting off with a new idea and seeing new ones suggested by the original one	1	2	3	4
7 Thinking about why the world is in the shape it is ..	1	2	3	4
8 Putting together a complicated picture puzzle	1	2	3	4
9 Learning how to put a watch together	1	2	3	4
10 Having new and exciting experiences and sensations even if they are a little frightening, unconventional or illegal	1	2	3	4
11 Taking off on a trip with no pre-planned or definite routes or timetable	1	2	3	4
12 Analyzing a theory to see if it is a good one	1	2	3	4
13 Trying to figure out the meaning of unusual statements	1	2	3	4
14 Scuba diving in the Bahamas	1	2	3	4
15 Thinking about the mathematical procedures possible with new calculating machines	1	2	3	4
16 Enquiring about things I don't understand	1	2	3	4
17 Reading a book entitled <u>How Things Work</u>	1	2	3	4

18	Walking into an old deserted house at midnight	1	2	3	4
19	Feelings chills run all over my body	1	2	3	4
20	Probing deeply into things	1	2	3	4
21	Being curious about things	1	2	3	4
22	Takings things apart to "see what makes them tick" ..	1	2	3	4
23	Having a vivid dream with strange colours and sounds.	1	2	3	4
24	Dreaming that I am lying on the beach with the waves washing over me	1	2	3	4
25	Walking across a swinging bridge over a deep gully ..	1	2	3	4
26	Skiing down a high slope in the Alps	1	2	3	4
27	Orbiting the earth in a space ship	1	2	3	4
28	Dropping everything to study something interesting that I have come across	1	2	3	4
29	Searching for answers	1	2	3	4
30	Figuring out how a light meter works	1	2	3	4
31	Exploring a city or section of town by myself even if it means getting lost	1	2	3	4
32	Driving a sportscar in the Indianapolis 500	1	2	3	4
33	Having an unusual dream in which I swim underwater for hours	1	2	3	4
34	Riding on a sled in Alaska pulled by Huskies	1	2	3	4
35	Camping out in a wilderness location	1	2	3	4
36	Trying surf-board riding	1	2	3	4
37	Being on a raft in the middle of the Colorado River .	1	2	3	4
38	Being excited by the prospect of learning new things.	1	2	3	4
39	Trying to figure out how an unusual piece of machinery works	1	2	3	4
40	Sometimes doing things that are a little frightening.	1	2	3	4
41	Figuring out how many bricks it would take to construct a fireplace	1	2	3	4
42	Experiencing the fascination of a piece of complicated machinery	1	2	3	4

APPENDIX H

FACTOR ANALYSIS TABLES: 42 ITEM SCALE

Table H.1 Correlation Matrix: 42 Item Scale

Table H.2 Table of Principal Factors: 42 Item Scale

Table H.3 Varimax Rotation of Three Factors: 42 Item Scale

Table H.4 Varimax Rotation of Four Factors: 42 Item Scale

Table H.1
Correlation Matrix: 42 Item Scale

IT01	IT02	IT03	IT04	IT05	IT06	IT07	IT08	IT09	IT10	IT11	IT12	IT13	IT14	IT15	IT16	IT17	IT18	IT19	IT20
1.0000	.1260	.2131	.1922	.1741	.1016	.0999	.0992	.0992	.0992	.0992	.0992	.0992	.0992	.0992	.0992	.0992	.0992	.0992	.0992
.1260	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.2131	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.1922	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.1741	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.1016	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0999	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000	.1311
.0992	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	.1311	1.0000


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IT42 ..... 1
IT43 ..... 1
IT44 ..... 1
IT40 ..... 1
IT39 ..... 1
IT38 ..... 1
IT37 ..... 1
IT36 ..... 1
IT35 ..... 1
IT34 ..... 1
IT33 ..... 1
IT32 ..... 1
IT31 ..... 1
IT30 ..... 1
IT29 ..... 1
IT28 ..... 1
IT27 ..... 1
IT26 ..... 1
IT25 ..... 1
IT24 ..... 1
IT23 ..... 1
IT22 ..... 1
IT21 ..... 1
IT20 ..... 1
IT19 ..... 1
IT18 ..... 1
IT17 ..... 1
IT16 ..... 1
IT15 ..... 1
IT14 ..... 1
IT13 ..... 1
IT12 ..... 1
IT11 ..... 1
IT10 ..... 1
IT09 ..... 1
IT08 ..... 1
IT07 ..... 1
IT06 ..... 1
IT05 ..... 1
IT04 ..... 1
IT03 ..... 1
IT02 ..... 1
IT01 ..... 1

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Table H.2
Table of Principal Factors: 42 Item Scale

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1101	.48536	1	7.75568	18.5	18.5
1102	.54118	2	6.89113	16.4	34.9
1103	.62119	3	2.98909	7.1	42.0
1104	.55270	4	1.25591	3.0	45.0
1105	.67933	5	1.50591	3.6	48.6
1106	.46034	6	1.44714	3.4	52.0
1107	.49955	7	1.33950	3.2	55.4
1108	.39772	8	1.19707	2.9	58.3
1109	.60532	9	1.06876	2.5	61.8
1110	.47855	10	1.04619	2.5	64.3
1111	.52225	11	1.03959	2.5	66.8
1112	.53707	12	.80825	2.0	69.0
1113	.50907	13	.88256	2.1	71.1
1114	.70612	14	.79034	1.9	73.0
1115	.47950	15	.75626	1.8	74.8
1116	.63319	16	.75235	1.8	76.6
1117	.60580	17	.71062	1.7	78.3
1118	.42994	18	.69393	1.7	80.0
1119	.51257	19	.65355	1.5	81.5
1120	.60825	20	.61112	1.5	82.9
1121	.92009	21	.56790	1.4	84.3
1122	.70294	22	.54668	1.3	85.6
1123	.46706	23	.53142	1.3	86.9
1124	.44535	24	.49169	1.2	88.0
1125	.45850	25	.46052	1.1	89.1
1126	.63573	26	.44770	1.1	90.2
1127	.52925	27	.43726	1.0	91.2
1128	.42155	28	.39461	.9	92.2
1129	.51455	29	.38525	.9	93.1
1130	.66333	30	.35353	.8	93.9
1131	.53014	31	.31147	.7	94.6
1132	.69089	32	.30434	.7	95.3
1133	.52579	33	.28760	.7	96.0
1134	.52579	34	.22706	.6	96.7
1135	.63167	35	.21201	.6	97.2
1136	.67849	36	.21003	.5	97.7
1137	.71184	37	.20210	.5	98.2
1138	.49259	38	.17845	.4	98.6
1139	.80070	39	.16753	.4	99.0
1140	.52538	40	.14343	.3	99.4
1141	.51827	41	.13353	.3	99.7
1142	.71233	42	.12380	.3	100.0

Table H.3
 Varimax Rotation of Three Factors^a: 42 Item Scale

Item and Subscale	Rotated Factors ^b			Item and Subscale	Rotated Factors ^b		
	1	2	3		1	2	3
01 B	56	-11	15	22 D	23	04	70
02 D	-11	59	11	23 B	47	25	-21
03 B	55	-35	09	24 B	31	08	-17
04 D	-10	59	15	25 B	55	-12	03
05 B	71	-15	27	26 B	68	-18	02
06 D	-09	50	02	27 B	61	-07	01
07 D	-04	53	14	28 D	04	42	06
08 D	-09	25	17	29 D	06	61	20
09 D	14	12	63	30 D	13	21	74
10 B	39	07	-07	31 B	36	08	17
11 B	42	09	-02	32 B	61	-09	01
12 D	-10	51	33	33 B	61	01	-10
13 D	-01	69	07	34 B	48	-05	01
14 B	72	-16	12	35 B	63	-06	07
15 D	04	22	50	36 B	60	-21	06
16 D	-05	68	28	37 B	75	-14	15
17 D	-05	20	64	38 D	-09	44	25
18 B	47	08	03	39 D	11	19	88
19 B	50	08	07	40 B	62	12	03
20 D	26	63	04	41 D	-04	27	52
21 D	02	55	08	42 D	02	27	75

Note. Decimal points omitted.

^aThese three factors accounted for 42.0% of the total variance.

^bValues >.29 have been entered in **bold** type.

Table H.4
 Varimax Rotation of Three Factors^a: 42 Item Scale

Item and Subscale	Rotated Factors ^b				Item and Subscale	Rotated Factors ^b			
	1	2	3	4		1	2	3	4
01 B	45	-11	16	33	22 D	18	04	70	14
02 D	-13	59	11	-03	23 B	28	23	-20	40
03 B	69	-25	06	01	24 B	26	09	-17	17
04 D	-15	58	15	02	25 B	48	-10	03	28
05 B	65	-11	26	32	26 B	62	-14	01	31
06 D	-15	49	02	03	27 B	61	00	-01	20
07 D	-17	49	16	15	28 D	05	45	04	-02
08 D	-03	28	16	-13	29 D	06	64	18	00
09 D	10	12	63	09	30 D	12	22	74	05
10 B	17	02	-04	43	31 B	11	01	20	46
11 B	16	03	01	50	32 B	43	-11	02	46
12 D	-15	50	34	02	33 B	56	05	-12	27
13 D	-12	66	08	12	34 B	46	00	-01	19
14 B	76	-07	09	18	35 B	43	-08	08	48
15 D	-03	20	51	09	36 B	75	-10	02	01
16 D	-07	69	27	-02	37 B	71	-08	14	31
17 D	02	23	63	-12	38 D	02	51	23	-20
18 B	21	02	06	52	39 D	05	18	89	10
19 B	28	04	08	47	40 B	33	06	06	60
20 D	08	61	05	30	41 D	-07	26	53	02
21 D	02	58	06	-01	42 D	02	28	75	00

Note. Decimal points omitted.

^aThese four factors accounted for 46.2% of the total variance.

^bValues >.29 have been entered in bold type.

APPENDIX I
40 ITEM SCALE
THE TWO FACTOR CURIOSITY SCALE

Below is a set of statements describing certain activities and experiences. Read each statement and then circle that number to the right of the statement which indicates the extent to which you would like that type of activity or experience.

There are no right or wrong answers. Do not spend too much time on any one statement.

	Do not like at all	Probably dislike	Probably like	Like very much
1 Steering a sled down a steep hill covered with trees..	1	2	3	4
2 Thinking of different ways to explain the same thing.	1	2	3	4
3 Taking up the sport of water-skiing.....	1	2	3	4
4 Figuring out why some event happened the way it did .	1	2	3	4
5 Riding the rapids in a swift moving stream	1	2	3	4
6 Starting off with a new idea and seeing new ones suggested by the original one	1	2	3	4
7 Thinking about why the world is in the shape it is ..	1	2	3	4
8 Putting together a complicated picture puzzle	1	2	3	4
9 Learning how to put a watch together	1	2	3	4
10 Having new and exciting experiences and sensations even if they are a little frightening, unconventional or illegal	1	2	3	4
11 Taking off on a trip with no pre-planned or definite routes or timetable	1	2	3	4
12 Analyzing a theory to see if it is a good one	1	2	3	4
13 Trying to figure out the meaning of unusual statements	1	2	3	4
14 Scuba diving in the Bahamas	1	2	3	4
15 Thinking about the mathematical procedures possible with new calculating machines	1	2	3	4
16 Enquiring about things I don't understand	1	2	3	4
17 Reading a book entitled <u>How Things Work</u>	1	2	3	4
18 Walking into an old deserted house at midnight	1	2	3	4
19 Feelings chills run all over my body	1	2	3	4

20 Probing deeply into things	1	2	3	4
21 Being curious about things	1	2	3	4
22 Having a vivid dream with strange colours and sounds.	1	2	3	4
23 Walking across a swinging bridge over a deep gully ..	1	2	3	4
24 Skiing down a high slope in the Alps	1	2	3	4
25 Orbiting the earth in a space ship	1	2	3	4
26 Dropping everything to study something interesting that I have come across	1	2	3	4
27 Searching for answers	1	2	3	4
28 Figuring out how a light meter works	1	2	3	4
29 Exploring a city or section of town by myself even if it means getting lost	1	2	3	4
30 Driving a sportscar in the Indianapolis 500	1	2	3	4
31 Having an unusual dream in which I swim underwater for hours	1	2	3	4
32 Riding on a sled in Alaska pulled by Huskies	1	2	3	4
33 Camping out in a wilderness location	1	2	3	4
34 Trying surf-board riding	1	2	3	4
35 Being on a raft in the middle of the Colorado River .	1	2	3	4
36 Being excited by the prospect of learning new things.	1	2	3	4
37 Trying to figure out how an unusual piece of machinery works	1	2	3	4
38 Sometimes doing things that are a little frightening.	1	2	3	4
39 Figuring out how many bricks it would take to construct a fireplace	1	2	3	4
40 Experiencing the fascination of a piece of complicated machinery	1	2	3	4

APPENDIX J
FACTOR ANALYSIS TABLES: 40 ITEM SCALE

Table J.1 Correlation Matrix: 40 Item Scale

Table J.2 Table of Principal Factors: 40 Item Scale

Table J.3 Varimax Rotation of Two Factors: 40 Item Scale

Table J.1
Correlation Matrix: 40 Item Scale

	IT01	IT02	IT03	IT04	IT05	IT06	IT07	IT08	IT09	IT10	IT11	IT12	IT13	IT14	IT15	IT16	IT17	IT18	IT19	IT20
IT01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT02	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT04	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT05	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT06	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT07	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT08	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT09	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT10	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT11	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT12	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT13	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT14	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000
IT15	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000
IT16	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000
IT17	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000
IT18	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000
IT19	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000
IT20	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000

1120
1119
1118
1117
1116
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1114
1113
1112
1111

1121
1120
1119
1118
1117
1116
1115
1114
1113
1112
1111

Table J.2
Table of Principal Factors: 40 Item Scale

VARIABLE.	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
II01	.48169	1	7.58697	19.0	19.0
II02	.52219	2	6.65233	16.8	35.6
II03	.66706	3	2.72097	6.8	42.4
II04	.55194	4	1.73929	4.3	46.7
II05	.66683	5	1.46907	3.7	50.4
II06	.42799	6	1.36699	3.4	53.8
II07	.47338	7	1.20437	3.0	56.8
II08	.38184	8	1.16598	2.9	59.8
II09	.58529	9	1.05614	2.6	62.4
II10	.45464	10	1.03611	2.6	65.0
II11	.52195	11	.97038	2.4	67.4
II12	.52676	12	.89001	2.2	69.6
II13	.58817	13	.86983	2.2	71.8
II14	.70385	14	.78362	2.0	73.8
II15	.47872	15	.74265	1.9	75.6
II16	.60912	16	.70895	1.8	77.4
II17	.58937	17	.68930	1.7	79.1
II18	.41506	18	.61447	1.5	80.7
II19	.50492	19	.60669	1.5	82.2
II20	.50137	20	.60016	1.5	83.7
II21	.61419	21	.55535	1.4	85.1
II22	.53067	22	.54778	1.4	86.7
II23	.52207	23	.48776	1.2	88.0
II24	.62248	24	.45591	1.1	89.1
II25	.55656	25	.45244	1.1	90.3
II26	.41870	26	.44664	1.1	91.4
II27	.48584	27	.39589	1.0	92.5
II28	.66075	28	.37732	.9	93.4
II29	.39423	29	.34363	.8	94.2
II30	.50160	30	.32981	.8	95.0
II31	.66150	31	.29073	.7	95.8
II32	.46725	32	.26766	.7	96.5
II33	.60557	33	.24440	.6	97.1
II34	.70702	34	.21253	.5	97.6
II35	.48989	35	.20494	.5	98.1
II36	.78595	36	.18756	.5	98.6
II37	.50853	37	.14881	.4	99.0
II38	.51354	38	.14169	.4	99.4
II39	.69663	39	.12831	.3	100.0
II40		40			
II41					
II42					

Note. Item numbers refer to position on the 42 item scale.

Table J.3
 Varimax Rotation of Two Factors^a: 40 Item Scale

Item and Subscale	Rotated Factors ^b		Item and Subscale	Rotated Factors ^b	
	1	2		1	2
01 B	59	01	21 D	-02	48
02 D	-16	54	22 B	36	06
03 B	59	-21	23 B	57	-09
04 D	-13	56	24 B	69	-14
05 B	77	04	25 B	60	-05
06 D	-14	42	26 D	00	37
07 D	-09	50	27 D	02	61
08 D	-09	31	28 D	22	60
09 D	22	46	29 B	37	16
10 B	34	00	30 B	60	-08
11 B	39	05	31 B	56	-07
12 D	-09	62	32 B	49	-03
13 D	-06	59	33 B	64	00
14 B	74	-05	34 B	63	-13
15 D	10	49	35 B	78	-02
16 D	-08	71	36 D	-10	51
17 D	04	54	37 D	23	66
18 B	45	08	38 B	59	10
19 B	49	09	39 D	03	54
20 D	17	50	40 D	12	66

Note. Decimal points omitted.

^aThese two factors accounted for 35.6% of the total variance.

^bValues >.29 have been entered in **bold** type.

APPENDIX K

FACTOR ANALYSIS TABLES: 20 ITEM SUBSCALES D AND B

Table K.1 Correlation Matrix: Subscale D

Table K.2 Table of Principal Factors: Subscale D

Table K.3 Varimax Rotation of Two Factors: Subscale D

Table K.4 Varimax Rotation of Three Factors: Subscale D

Table K.5 Varimax Rotation of Four Factors: Subscale D

Table K.6 Varimax Rotation of Five Factors: Subscale D

Table K.7 Correlation Matrix: Subscale B

Table K.8 Table of Principal Factors: Subscale B

Table K.9 Varimax Rotation of Two Factors: Subscale B

Table K.10 Varimax Rotation of Three Factors: Subscale B

Table K.11 Varimax Rotation of Four Factors: Subscale B

Table K.1

Correlation Matrix: Subscale D

	IT04	IT06	IT07	IT08	IT09	IT12	IT13	IT15	IT16
IT04	1.00000								
IT06	.49000	1.00000							
IT07	.21200	.31652	1.00000						
IT08	.21200	.31652	.49000	1.00000					
IT09	.21200	.31652	.31652	.49000	1.00000				
IT12	.21200	.31652	.31652	.31652	.49000	1.00000			
IT13	.21200	.31652	.31652	.31652	.31652	.49000	1.00000		
IT15	.21200	.31652	.31652	.31652	.31652	.31652	.49000	1.00000	
IT16	.21200	.31652	.31652	.31652	.31652	.31652	.31652	.49000	1.00000
IT21									
IT26									
IT29									
IT30									
IT33									
IT36									
IT41									
IT42									

Note. Item numbers refer to position on the 42 item scale.

Table K.2
Table of Principal Factors: Subscale D

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM-PCT
IT62	.38762	1	6.44582	32.2	32.2
IT04	.41399	3	2.72257	12.9	45.1
IT06	.27183	5	1.34455	6.0	51.1
IT07	.36728	4	1.10455	5.0	56.1
IT08	.23632	5	1.00316	5.0	61.1
IT09	.49153	6	.85919	4.0	65.1
IT12	.45603	7	.72702	3.0	70.1
IT15	.48881	8	.67439	3.0	73.1
IT16	.40522	9	.59855	2.9	76.1
IT17	.47452	10	.53646	2.9	80.1
IT20	.42446	11	.53272	2.2	85.1
IT21	.43868	13	.49162	2.2	88.1
IT29	.29194	14	.42275	2.0	90.1
IT30	.43563	15	.40929	2.0	92.1
IT38	.41460	17	.34552	1.7	93.8
IT39	.73997	18	.29706	1.0	94.8
IT41	.38546	19	.24620	1.0	95.8
IT42	.65839	20	.19024	0.9	100.0

Note. Item numbers refer to position on the 42 item scale.

Table K.3
 Varimax Rotation of Two Factors^a:
 Subscale D

Item ^c	Rotated Factors ^b	
	1	2
02	59	13
04	58	18
06	49	03
07	49	18
08	25	18
09	06	65
12	49	38
13	68	12
15	19	52
16	68	28
17	20	61
20	55	12
21	55	10
26	43	07
27	61	24
28	15	77
36	47	22
37	14	89
39	23	53
40	23	77

Note. Decimal points omitted.

^aThese two factors accounted for 44.5% of the total variance.

^bValues >.29 have been entered in bold type.

^cItem numbers refer to position on the 40 item scale - Appendix I.

Table K.4
 Varimax Rotation of Three Factors^a:
 Subscale D

Item ^c	Rotated Factors ^b		
	1	2	3
02	11	48	35
04	17	55	26
06	02	41	27
07	16	62	06
08	17	17	20
09	64	02	11
12	37	56	12
13	09	69	26
15	52	27	00
16	25	53	44
17	60	18	12
20	10	37	41
21	06	17	72
26	06	19	46
27	22	43	44
28	76	06	21
36	21	13	61
37	89	09	15
39	53	30	03
40	77	16	21

Note. Decimal points omitted.

^aThese three factors accounted for 51.2% of the total variance.

^bValues >.29 have been entered in bold type.

^cItem numbers refer to position on 40 item scale - Appendix I.

Table K.5
 Varimax Rotation of Four Factors^a:
 Subscale D

Item ^c	Rotated Factors ^b			
	1	2	3	4
02	11	46	35	10
04	15	55	24	21
06	04	40	30	-09
07	15	63	04	18
08	12	16	16	45
09	62	-01	05	43
12	41	58	15	-18
13	09	67	26	13
15	54	27	02	-05
16	27	51	46	00
17	58	17	09	27
20	11	36	41	05
21	05	15	70	17
26	05	18	46	05
27	22	41	44	11
28	76	04	21	07
36	21	11	63	02
37	89	08	16	05
39	52	29	03	06
40	78	14	23	00

Note. Decimal points omitted.

^aThese four factors accounted for 56.7% of the total variance.

^bValues >.29 have been entered in **bold** type.

^cItem numbers refer to position on 40 item scale - Appendix I.

Table K.6
 Varimax Rotation of Five Factors^a:
 Subscale D

Item ^c	Rotated Factors ^b				
	1	2	3	4	5
02	10	49	33	05	13
04	15	55	18	14	21
06	03	44	32	-02	-07
07	15	61	-05	16	16
08	11	17	14	02	47
09	63	-02	-01	14	41
12	41	57	11	11	-18
13	09	67	18	17	13
15	54	26	-02	07	-06
16	26	54	44	10	03
17	58	19	12	-10	31
20	11	34	21	66	-02
21	05	16	55	43	18
26	05	20	39	19	07
27	22	41	33	31	11
28	76	04	16	15	06
36	20	13	74	01	07
37	89	08	13	09	05
39	52	31	07	-10	09
40	77	15	21	07	01

Note. Decimal points omitted.

^aThese five factors accounted for 61.7% of the total variance.

^bValues >.29 have been entered in bold type.

^cItem numbers refer to position on 40 item scale - Appendix I.

Table K.7
Correlation Matrix: Subscale B

	IT01	IT03	IT05	IT10	IT11	IT14	IT18	IT19	IT23	IT25
IT01	1.0000									
IT03	.2303	1.0000								
IT05	.4722	.4022	1.0000							
IT10	.1753	.1505	.1505	1.0000						
IT11	.1146	.1194	.1300	.1194	1.0000					
IT14	.3627	.3207	.3207	.3207	.3207	1.0000				
IT18	.2523	.1407	.1407	.1407	.1407	.1407	1.0000			
IT19	.2900	.2027	.2027	.2027	.2027	.2027	.2027	1.0000		
IT23	.1646	.1646	.1646	.1646	.1646	.1646	.1646	.1646	1.0000	
IT25	.1522	.1522	.1522	.1522	.1522	.1522	.1522	.1522	.1522	1.0000
IT26	.5451	.5219	.5219	.5219	.5219	.5219	.5219	.5219	.5219	.5219
IT27	.5219	.5451	.5451	.5451	.5451	.5451	.5451	.5451	.5451	.5451
IT31	.4596	.4596	.4596	.4596	.4596	.4596	.4596	.4596	.4596	.4596
IT32	.2422	.2422	.2422	.2422	.2422	.2422	.2422	.2422	.2422	.2422
IT33	.3711	.3711	.3711	.3711	.3711	.3711	.3711	.3711	.3711	.3711
IT34	.5528	.5528	.5528	.5528	.5528	.5528	.5528	.5528	.5528	.5528
IT35	.2654	.2654	.2654	.2654	.2654	.2654	.2654	.2654	.2654	.2654
IT36	.1067	.1067	.1067	.1067	.1067	.1067	.1067	.1067	.1067	.1067
IT37	.1207	.1207	.1207	.1207	.1207	.1207	.1207	.1207	.1207	.1207
IT40	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Note. Item numbers refer to position on the 42 item scale.

Table K.8
Table of Principal Factors: Subscale B

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
IT01	.38441	1	7.29548	36.5	36.5
IT02	.57907	2	1.72655	8.2	44.7
IT05	.57178	3	1.74234	8.2	52.9
IT10	.29578	4	1.11221	5.2	58.1
IT11	.42225	5	.99299	4.7	62.8
IT14	.61778	6	.80074	4.0	66.8
IT19	.35817	7	.73731	3.7	70.5
IT23	.39520	8	.66304	3.3	73.8
IT25	.38953	9	.61528	3.1	76.9
IT26	.55679	10	.57895	2.7	79.6
IT27	.47218	11	.52827	2.5	82.1
IT31	.26359	12	.47781	2.3	84.4
IT32	.42513	13	.45315	2.3	86.7
IT33	.55862	14	.42703	2.1	88.8
IT35	.54529	15	.34307	1.6	90.4
IT36	.53525	16	.31329	1.5	91.9
IT37	.58658	17	.27733	1.3	93.2
IT40	.43639	18	.24332	1.2	94.4
		19			95.6
		20			96.8
					98.0
					100.0

Note. Item numbers refer to position on the 42 item scale.

Table K.9
 Varimax Rotation of Two Factors^a:
 Subscale B

Item ^c	Rotated Factors ^b	
	1	2
01	47	33
03	71	04
05	66	35
10	13	43
11	07	54
14	75	24
18	22	49
19	27	46
22	22	40
23	48	32
24	62	33
25	56	28
29	10	48
30	39	47
31	49	33
32	43	24
33	40	53
34	78	07
35	69	37
38	25	67

Note. Decimal Points omitted.

^aThese two factors accounted for 45.1% of the total variance.

^bValues >.29 have been entered in bold type.

^cItem numbers refer to position on 40 item scale - Appendix I.

Table K.10
 Varimax Rotation of Three Factors^a:
 Subscale B

Item ^c	Rotated Factors ^b		
	1	2	3
01	49	35	03
03	69	02	17
05	69	36	06
10	10	40	18
11	07	55	08
14	70	18	31
18	19	45	21
19	24	43	22
22	07	29	61
23	48	31	10
24	64	33	08
25	50	20	35
29	10	47	10
30	34	41	32
31	36	17	70
32	44	25	05
33	42	55	04
34	75	04	20
35	65	32	29
38	25	67	12

Note. Decimal points omitted.

^aThese three factors accounted for 51.3% of the total variance.

^bValues >.29 have been entered in **bold** type.

^cItem numbers refer to position on 40 item scale - Appendix I.

Table K.11
 Varimax Rotation of Four Factors^a:
 Subscale B

Item ^c	Rotated Factors ^d			
	1	2	3	4
01	48	18	36	00
03	68	03	03	16
05	69	26	25	05
10	11	40	15	16
11	07	76	-01	09
14	71	17	08	32
18	15	21	55	17
19	19	14	64	16
22	08	22	22	57
23	47	18	30	08
24	64	22	29	05
25	49	10	25	32
29	11	39	22	10
30	34	27	35	29
31	36	12	11	74
32	45	20	15	05
33	43	51	22	04
34	75	01	09	18
35	66	29	14	30
38	26	53	37	11

Note. Decimal points omitted.

^aThese four factors accounted for 56.9% of the total variance.

^dValues >.29 have been entered in bold type.

^cItem numbers refer to position on 40 item scale - Appendix 1.

APPENDIX L
ITEM-TOTAL CORRELATIONS: SUBSCALES D AND B

Table L.1
Item-Total Correlations: Subscales D and B

Subscale D		Subscale B	
Item	Item-Total Correlation	Item	Item-Total Correlation
02	.48	01	.55
04	.52	03	.55
06	.36	05	.70
07	.46	10	.35
08	.30	11	.38
09	.45	14	.69
12	.58	18	.44
13	.54	19	.47
15	.46	22	.38
16	.66	23	.54
17	.53	24	.66
20	.45	25	.58
21	.44	29	.34
26	.33	30	.59
27	.57	31	.56
28	.58	32	.46
36	.47	33	.61
37	.64	34	.59
39	.51	35	.74
40	.64	38	.59

APPENDIX M
FLOOR-CEILING EFFECTS: RESPONSE DISTRIBUTIONS
FOR D AND B SUBSCALE ITEMS

- Table M.1 Floor-ceiling Effects: Frequency of Responses for each Response Category: Subscale D
- Table M.2 Floor-ceiling Effects: Frequency of Responses for each Response Category: Subscale B

Table M.1
 Floor-Ceiling Effects: Frequency of Responses for each Response
 Category: Subscale D

Item	Response Category				Missing Data
	1	2	3	4	
02	42	50	61	19	-
04	4	28	75	65	-
06	5	27	85	53	2
07	25	58	56	32	1
08	15	37	61	59	-
09	39	55	53	24	1
12	17	50	80	25	-
13	14	42	91	25	-
15	67	52	43	10	-
16	5	18	101	48	-
17	21	60	65	26	-
20	7	38	86	41	-
21	1	7	100	63	1
26	5	17	88	62	-
27	6	24	110	32	-
28	44	76	34	18	-
36	4	14	112	42	-
37	35	58	56	23	-
39	56	63	41	11	1
40	45	53	60	14	-

Table M.2
 Floor-Ceiling Effects: Frequency of Responses for Each
 Response Category: Subscale B

Item	Response Category				Missing Data
	1	2	3	4	
01	42	50	61	19	-
03	19	19	50	84	-
05	35	35	58	44	-
10	5	25	78	64	-
11	8	20	40	104	-
14	33	30	53	56	-
18	55	63	35	18	1
19	49	74	34	15	-
22	14	52	60	46	-
23	48	49	50	63	-
24	32	22	55	25	-
25	32	43	51	45	1
29	14	34	74	50	-
30	33	43	38	58	-
31	30	35	70	37	-
32	12	23	60	77	-
33	17	19	56	80	-
34	21	23	68	60	-
35	38	42	57	35	-
38	6	28	104	33	1

APPENDIX N
OTIMSD CORRELATIONS WITH CURIOSITY SCALES

Table N.1
 Correlation Coefficients: OTIMSD with Curiosity Scales
 (N = 171)

Scale	<u>r</u>
SSTA	-.02
SSES	.04
SSDis	-.11
SSBS	-.14
NESES	.01
NESIC	.11
NESIS	.01
NESEC	.24*
IM	.20
OTIMSC	.25*
OTIMDC	-.12
MCIT	.24*

*p<.001

APPENDIX 0

FACTOR ANALYSIS TABLES: THE TWO FACTOR CURIOSITY SCALE

Table 0.1 Correlation Matrix: The Two Factor Curiosity Scale

Table 0.2 Table of Principal Factors: The Two Factor Curiosity Scale

Table 0.3 Varimax Rotation of Three Factors: The Two Factor Curiosity Scale

Table 0.4 Varimax Rotation of Four Factors: The Two Factor Curiosity Scale

Table 0.5 Varimax Rotation of Five Factors: The Two Factor Curiosity Scale

Table 0.1
Correlation Matrix: The Two Factor Curiosity Scale

ITC-0	ITC-1	ITC-2	ITC-3	ITC-4	ITC-5	ITC-6	ITC-7	ITC-8	ITC-9	ITC-10	ITC-11	ITC-12	ITC-13	ITC-14	ITC-15	ITC-16	ITC-17	ITC-18	ITC-19	ITC-20
1.00	0.15	0.12	0.18	0.10	0.14	0.16	0.13	0.17	0.11	0.15	0.14	0.16	0.13	0.17	0.12	0.15	0.14	0.16	0.13	0.17
0.15	1.00	0.16	0.14	0.12	0.18	0.15	0.17	0.13	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.15	0.14	0.16	0.13	0.17
0.12	0.16	1.00	0.15	0.14	0.13	0.17	0.16	0.12	0.15	0.14	0.16	0.13	0.17	0.12	0.15	0.14	0.16	0.13	0.17	0.14
0.18	0.14	0.15	1.00	0.16	0.14	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.15	0.14	0.16	0.13	0.17
0.10	0.17	0.12	0.17	1.00	0.15	0.14	0.13	0.17	0.16	0.12	0.15	0.17	0.12	0.16	0.13	0.15	0.14	0.16	0.13	0.17
0.14	0.15	0.17	0.13	0.15	1.00	0.16	0.14	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.15	0.14	0.16
0.16	0.13	0.16	0.17	0.12	0.16	1.00	0.14	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.15	0.14	0.16
0.13	0.17	0.12	0.17	0.16	0.13	0.17	1.00	0.14	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.15	0.16
0.17	0.13	0.16	0.13	0.17	0.15	0.16	0.14	1.00	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.15	0.16
0.14	0.16	0.14	0.15	0.12	0.16	0.13	0.17	0.15	1.00	0.14	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13
0.15	0.14	0.17	0.13	0.16	0.15	0.16	0.14	0.15	0.17	1.00	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13
0.16	0.13	0.15	0.17	0.12	0.16	0.13	0.17	0.15	0.16	0.14	1.00	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16
0.13	0.17	0.12	0.17	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	1.00	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12
0.17	0.13	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	1.00	0.13	0.17	0.15	0.16	0.14	0.15	0.16
0.14	0.16	0.14	0.15	0.12	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.13	1.00	0.13	0.17	0.15	0.16	0.14	0.15
0.15	0.14	0.17	0.13	0.16	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.17	0.13	1.00	0.13	0.17	0.15	0.16	0.14
0.16	0.13	0.15	0.17	0.12	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.13	0.17	0.13	1.00	0.13	0.17	0.15	0.16
0.13	0.17	0.12	0.17	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.13	0.17	0.13	0.17	0.13	1.00	0.13	0.17	0.15
0.17	0.13	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.17	0.13	0.17	0.13	0.17	1.00	0.13	0.15
0.14	0.16	0.14	0.15	0.12	0.16	0.13	0.17	0.15	0.16	0.14	0.15	0.17	0.13	0.17	0.13	0.17	0.13	0.17	1.00	0.13
0.15	0.14	0.17	0.13	0.16	0.15	0.16	0.14	0.15	0.17	0.12	0.16	0.13	0.17	0.13	0.17	0.13	0.17	0.13	0.17	1.00

Table 0.2
Table of Principal Factors: The Two Factor Curiosity Scale

VARIABLE	EST..COMMUNALITY	FACTOR	EIGENVALUE	PCT. OF VAR	CUM. PCT.
ITEM01	.35022	1	7.65791	19.1	19.1
ITEM02	.44714	3	5.22968	13.1	32.3
ITEM04	.44230	3	2.87299	7.2	39.5
ITEM05	.39217	3	1.27071	3.2	42.7
ITEM06	.42191	3	1.11905	2.8	45.5
ITEM07	.31055	7	1.04359	2.6	48.1
ITEM08	.38794	8	1.05012	2.7	50.8
ITEM09	.30494	10	.90617	2.3	53.1
ITEM11	.50934	11	.85715	2.1	55.2
ITEM12	.42440	12	.82185	2.1	57.3
ITEM13	.42440	13	.79191	2.0	59.3
ITEM14	.35519	14	.75963	1.9	61.2
ITEM15	.37527	15	.74599	1.9	63.1
ITEM16	.40577	17	.72019	1.8	64.9
ITEM18	.39888	17	.70700	1.8	66.7
ITEM19	.40120	19	.67100	1.7	68.4
ITEM20	.41574	19	.62152	1.6	70.0
ITEM21	.42586	20	.61689	1.6	71.6
ITEM22	.42586	21	.60647	1.5	73.1
ITEM23	.42586	22	.58947	1.5	74.6
ITEM24	.37368	23	.53345	1.4	76.0
ITEM25	.37368	23	.52348	1.3	77.3
ITEM26	.55095	25	.50279	1.3	78.6
ITEM27	.41474	26	.48318	1.2	80.0
ITEM28	.35895	28	.47074	1.2	81.2
ITEM29	.35895	29	.46343	1.2	82.4
ITEM30	.42586	30	.42136	1.1	83.5
ITEM31	.42586	31	.41718	1.1	84.6
ITEM32	.39099	32	.37715	1.0	85.7
ITEM33	.39099	33	.35671	.9	86.9
ITEM34	.45121	34	.34671	.9	88.1
ITEM35	.34894	35	.32848	.8	89.3
ITEM36	.44857	36	.31937	.8	90.5
ITEM37	.44857	37	.31474	.8	91.6
ITEM38	.37457	38	.29896	.7	92.8
ITEM39	.37457	39	.28590	.7	93.8
ITEM40	.67457	40	.20590	.5	94.5
					95.5
					96.4
					97.2
					98.0
					98.7
					99.5
					100.0

Table 0.3
 Varimax Rotation of Three Factors^a:
 The Two Factor Curiosity Scale ($N = 609$)

Item and Subscale	Rotated Factor ^b			Item and Subscale	Rotated Factor ^b		
	1	2	3		1	2	3
01 B	54	09	21	21 D	15	56	01
02 D	02	54	-06	22 B	31	31	-07
03 B	53	01	-03	23 B	60	-02	07
04 D	04	64	07	24 B	65	-05	06
05 B	70	01	11	25 B	49	10	28
06 D	02	58	06	26 D	13	41	09
07 D	02	58	22	27 D	-03	67	25
08 D	-01	30	19	28 D	09	20	71
09 D	16	07	64	29 B	36	17	10
10 B	46	11	-14	30 B	50	-15	24
11 B	40	07	-19	31 B	48	11	03
12 D	-02	63	27	32 B	59	00	08
13 D	-05	63	13	33 B	59	08	11
14 B	61	03	10	34 B	53	-09	-05
15 D	-11	30	45	35 B	68	01	11
16 D	-02	53	11	36 D	08	55	17
17 D	03	27	62	37 D	10	17	77
18 B	47	04	06	38 B	52	11	05
19 B	41	08	-08	39 D	12	19	50
20 D	24	52	07	40 D	09	14	80

Note. Decimal points omitted.

^aThese three factors accounted for 39.4% of the total variance.

^bValues $>.29$ have been entered in bold type.

Table 0.4
 Varimax Rotation of Four Factors^a:
 The Two Factor Curiosity Scale ($N = 609$)

Item and Subscale	Rotated Factor ^b				Item and Subscale	Rotated Factor ^b			
	1	2	3	4		1	2	3	4
01 B	48	09	21	24	21 D	04	54	03	27
02 D	02	54	-07	03	22 B	16	28	-04	36
03 B	62	05	-08	-02	23 B	44	-06	09	44
04 D	05	64	06	00	24 B	66	-04	04	15
05 B	72	03	08	15	25 B	49	11	27	12
06 D	02	58	06	03	26 D	15	42	08	02
07 D	04	59	21	-03	27 D	-01	68	24	-02
08 D	02	31	18	-04	28 D	10	21	70	00
09 D	18	09	63	-01	29 B	27	14	12	27
10 B	27	06	-11	48	30 B	45	-16	24	21
11 B	30	06	-18	29	31 B	40	10	03	25
12 D	-04	62	27	04	32 B	62	02	05	11
13 D	-04	64	12	-01	33 B	58	09	09	16
14 B	64	06	07	11	34 B	60	-05	-08	02
15 D	-08	31	45	-08	35 B	67	02	09	18
16 D	-04	5?	11	05	36 D	07	55	16	05
17 D	05	28	62	-02	37 D	09	17	78	05
18 B	16	-06	15	73	38 B	33	06	09	48
19 B	14	01	-03	62	39 D	10	19	50	09
20 D	10	49	09	33	40 D	05	13	82	09

Note. Decimal points omitted.

^aThese four factors accounted for 44.1% of the total variance.

^bValues >.29 have been entered in bold type.

Table 0.5
 Varimax Rotation of Five Factors^a:
 The Two Factor Curiosity Scale ($N = 609$)

Item and Subscale	Rotated Factor ^b					Item and Subscale	Rotated Factor ^b				
	1	2	3	4	5		1	2	3	4	5
01 B	49	09	21	22	-07	21 D	05	56	04	24	-12
02 D	01	53	-06	04	17	22 B	17	29	-04	35	-04
03 B	62	03	-08	-02	20	23 B	46	-03	09	42	-16
04 D	05	63	07	01	16	24 B	66	-03	03	13	-03
05 B	72	03	08	13	-01	25 B	50	11	27	10	-04
06 D	02	56	07	04	20	26 D	16	43	09	-02	-13
07 D	03	56	22	-01	38	27 D	00	71	25	-07	-21
08 D	01	28	19	-01	34	28 D	11	20	70	-01	00
09 D	18	04	65	02	28	29 B	28	15	12	25	-07
10 B	28	06	-10	49	08	30 B	45	-15	24	21	02
11 B	30	07	-18	28	-01	31 B	41	10	03	24	-02
12 D	-03	61	29	04	07	32 B	62	02	05	10	04
13 D	-04	62	14	00	17	33 B	59	10	09	14	-08
14 B	64	05	06	10	03	34 B	60	-06	-09	02	10
15 D	-07	30	45	-09	-04	35 B	68	04	08	16	-07
16 D	-03	53	13	03	-06	36 D	08	56	17	02	-10
17 D	06	27	62	-04	-05	37 D	10	16	78	04	-07
18 B	18	-05	14	75	02	38 B	35	08	09	46	-09
19 B	15	01	-03	64	06	39 D	10	16	51	09	16
20 D	11	50	10	31	-05	40 D	07	11	82	08	-03

Note. Decimal points omitted.

^aThese five factors accounted for 47.3% of the total variance.

^bValues $>.29$ have been entered in bold type.

APPENDIX P

FACTOR ANALYSIS TABLES: THE TWO FACTOR CURIOSITY SCALE

FEMALES

Table P.1 Correlation Matrix: Females

Table P.2 Table of Principal Factors: Females

Table P.3 Varimax Rotation of Three Factors: Females

Table P.4 Varimax Rotation of Four Factors: Females

Table P.1

Correlation Matrix: Females

ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20
1.000																			
0.450	1.000																		
0.320	0.280	1.000																	
0.150	0.100	0.080	1.000																
0.220	0.180	0.120	0.150	1.000															
0.300	0.250	0.180	0.200	0.350	1.000														
0.180	0.120	0.050	0.100	0.150	0.100	1.000													
0.250	0.200	0.150	0.180	0.280	0.220	0.180	1.000												
0.100	0.080	0.020	0.050	0.120	0.080	0.050	0.080	1.000											
0.150	0.120	0.080	0.100	0.180	0.150	0.100	0.120	0.150	1.000										
0.200	0.180	0.120	0.150	0.250	0.200	0.150	0.180	0.200	0.250	1.000									
0.080	0.050	0.020	0.030	0.100	0.080	0.050	0.050	0.080	0.100	0.080	1.000								
0.120	0.100	0.080	0.100	0.150	0.120	0.080	0.100	0.120	0.150	0.120	0.100	1.000							
0.180	0.150	0.100	0.120	0.200	0.180	0.120	0.150	0.180	0.200	0.180	0.150	0.180	1.000						
0.050	0.030	0.010	0.020	0.080	0.050	0.030	0.030	0.050	0.080	0.050	0.030	0.050	0.080	1.000					
0.100	0.080	0.050	0.080	0.120	0.100	0.080	0.100	0.120	0.150	0.100	0.080	0.100	0.120	0.150	1.000				
0.150	0.120	0.080	0.100	0.180	0.150	0.100	0.120	0.150	0.180	0.150	0.120	0.150	0.180	0.200	0.150	1.000			
0.080	0.050	0.020	0.030	0.100	0.080	0.050	0.050	0.080	0.100	0.080	0.050	0.080	0.100	0.120	0.100	0.080	1.000		
0.120	0.100	0.080	0.100	0.150	0.120	0.080	0.100	0.120	0.150	0.120	0.100	0.120	0.150	0.180	0.150	0.120	0.100	1.000	
0.180	0.150	0.100	0.120	0.200	0.180	0.120	0.150	0.180	0.200	0.180	0.150	0.180	0.200	0.220	0.180	0.150	0.180	0.200	1.000

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Table P.2
Table of Principal Factors: Females

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCI OF VAR	CUM PCI
ITEM01	.43228	1	7.40659	18.5	18.5
ITEM02	.33196	2	4.87879	12.9	31.4
ITEM03	.54786	3	2.76247	6.9	38.3
ITEM04	.54786	4	1.82402	4.6	42.9
ITEM05	.49909	5	1.43152	3.6	46.5
ITEM06	.46201	6	1.36794	3.4	49.9
ITEM07	.38079	7	1.25974	3.0	52.9
ITEM08	.32079	8	1.17097	2.8	55.7
ITEM09	.51196	9	1.03407	2.6	58.3
ITEM10	.45027	10	1.00844	2.5	60.8
ITEM11	.51027	11	1.00552	2.4	63.2
ITEM12	.49870	12	.97110	2.3	65.5
ITEM13	.39863	13	.84283	2.1	67.6
ITEM14	.38713	14	.80338	2.0	69.5
ITEM15	.39268	15	.80390	2.0	71.5
ITEM16	.43348	16	.74154	1.9	73.3
ITEM17	.54693	17	.70248	1.9	75.2
ITEM18	.48213	18	.65659	1.7	76.9
ITEM19	.43833	19	.61519	1.6	78.5
ITEM20	.53766	20	.59819	1.5	80.0
ITEM21	.43385	21	.55337	1.4	81.4
ITEM22	.46612	22	.50766	1.4	82.8
ITEM23	.44134	23	.50019	1.3	84.1
ITEM24	.40814	24	.4792	1.2	85.3
ITEM25	.58977	25	.4717	1.1	86.5
ITEM26	.52168	26	.443	1.1	87.6
ITEM27	.37899	27	.4044	1.0	88.6
ITEM28	.27899	28	.37899	1.0	89.6
ITEM29	.26653	29	.36653	1.0	90.6
ITEM30	.50982	30	.36653	1.0	91.6
ITEM31	.41982	31	.36653	1.0	92.6
ITEM32	.53948	32	.36653	1.0	93.6
ITEM33	.41182	33	.36653	1.0	94.6
ITEM34	.41182	34	.36653	1.0	95.6
ITEM35	.42978	35	.36653	1.0	96.6
ITEM36	.42978	36	.36653	1.0	97.6
ITEM37	.42978	37	.36653	1.0	98.6
ITEM38	.42978	38	.36653	1.0	99.6
ITEM39	.42978	39	.36653	1.0	100.6
ITEM40	.42978	40	.36653	1.0	101.6

Table P.3
 Varimax Rotation of Three Factors^a: Females
 (n = 258)

Item and Subscale	Rotated Factor ^b			Item and Subscale	Rotated Factor ^b		
	1	2	3		1	2	3
01 B	48	12	09	21 D	26	61	-06
02 D	00	51	01	22 B	38	32	-10
03 B	51	-06	08	23 B	56	04	-10
04 D	11	63	16	24 B	62	-07	06
05 B	67	06	09	25 B	50	16	25
06 D	-03	56	12	26 D	28	29	21
07 D	00	48	34	27 D	05	60	34
08 D	04	21	32	28 D	08	14	65
09 D	14	09	61	29 B	40	24	03
10 B	33	24	-29	30 B	44	00	12
11 B	40	12	-20	31 B	36	09	02
12 D	-04	56	34	32 B	60	-02	17
13 D	-10	59	26	33 B	58	03	20
14 B	55	-01	08	34 B	56	-10	-01
15 D	-04	23	45	35 B	66	-02	14
16 D	07	51	17	36 D	11	43	26
17 D	-04	30	49	37 D	09	13	75
18 B	44	16	-17	38 B	47	16	-04
19 B	41	17	-27	39 D	14	15	42
20 D	25	57	01	40 D	06	12	71

Note. Decimal points omitted.

^aThese three factors accounted for 37.6% of the total variance.

^bValues >.29 have been entered in bold type.

Table P.4
 Varimax Rotation of Four Factors^a: Females
 (n = 258)

Item and Subscale	Rotated Factor ^b				Item and Subscale	Rotated Factor ^b			
	1	2	3	4		1	2	3	4
01 B	44	12	09	20	21 D	14	56	-04	32
02 D	01	54	-06	01	22 B	20	22	-01	44
03 B	60	01	-01	-03	23 B	44	-02	-03	37
04 D	12	67	09	06	24 B	64	-04	02	12
05 B	68	09	04	17	25 B	48	18	23	16
06 D	-02	60	05	00	26 D	30	33	15	05
07 D	02	52	29	-01	27 D	04	63	30	05
08 D	04	22	31	00	28 D	08	16	66	-03
09 D	15	12	61	-03	29 B	32	20	06	27
10 B	15	12	-17	47	30 B	35	-04	19	27
11 B	31	07	-16	29	31 B	27	05	07	26
12 D	-03	59	29	00	32 B	59	00	15	16
13 D	-10	61	22	01	33 B	57	05	18	16
14 B	58	03	02	09	34 B	65	-03	-10	00
15 D	03	30	38	-16	35 B	67	02	10	15
16 D	04	50	15	12	36 D	12	46	21	03
17 D	01	36	43	-12	37 D	08	14	79	-01
18 B	11	-05	06	78	38 B	29	06	07	46
19 B	14	-01	-09	64	39 D	12	16	44	06
20 D	11	50	07	35	40 D	02	10	80	04

Note. Decimal points omitted.

^aThese four factors accounted for 42.2% of the total variance.

^bValues >.29 have been entered in **bold** type.

APPENDIX Q

FACTOR ANALYSIS TABLES: THE TWO FACTOR CURIOSITY SCALE

MALES

Table Q.1 Correlation Matrix: Males

Table Q.2 Table of Principal Factors: Males

Table Q.3 Varimax Rotation of Three Factors: Males

Table Q.4 Varimax Rotation of Four Factors: Males

Table Q.1
Correlation Matrix: Males

ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20	
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ITEM 20

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ITEM 17

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ITEM 15

ITEM 14

ITEM 13

ITEM 12

ITEM 11

ITEM 10

ITEM 30

ITEM 29

ITEM 28

ITEM 27

ITEM 26

ITEM 25

ITEM 24

ITEM 23

ITEM 22

ITEM 21

ITEM 20

ITEM 39
 ITEM 38
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 ITEM 2
 ITEM 1

Table Q.2
Table of Principal Factors: Males

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
ITEM01	.39910	1	7.53905	18.8	18.8
ITEM02	.44093	2	5.88369	14.7	33.6
ITEM03	.50416	3	2.45191	6.2	39.7
ITEM04	.47084	4	1.91047	4.9	44.6
ITEM05	.57605	5	1.41232	3.5	48.0
ITEM06	.41780	6	1.23430	3.2	51.2
ITEM07	.52054	7	1.14630	2.9	54.1
ITEM08	.37617	8	1.02178	2.6	56.6
ITEM09	.48907	9	.96987	2.4	59.1
ITEM10	.44143	10	.91258	2.3	61.4
ITEM11	.35027	11	.83435	2.1	63.6
ITEM12	.54417	12	.81305	2.0	65.7
ITEM13	.48524	13	.81305	2.0	67.7
ITEM14	.48833	14	.79125	1.9	69.7
ITEM15	.41221	15	.73961	1.9	71.6
ITEM16	.38707	16	.72277	1.8	73.4
ITEM17	.52858	17	.69237	1.7	75.1
ITEM18	.50865	18	.65838	1.6	76.8
ITEM19	.40875	19	.65320	1.6	78.4
ITEM20	.41547	20	.61320	1.5	80.0
ITEM21	.39074	21	.61320	1.5	81.5
ITEM22	.26816	22	.51351	1.3	82.9
ITEM23	.44084	23	.50453	1.3	84.4
ITEM24	.47849	24	.50166	1.3	85.6
ITEM25	.36573	25	.49699	1.2	86.9
ITEM26	.33015	26	.47336	1.1	88.1
ITEM27	.51682	27	.47336	1.1	89.2
ITEM28	.51682	28	.47336	1.1	90.3
ITEM29	.25297	29	.43222	1.0	91.3
ITEM30	.39938	30	.37440	0.9	92.2
ITEM31	.45412	31	.37440	0.9	93.1
ITEM32	.44152	32	.37440	0.9	94.0
ITEM33	.40855	33	.37440	0.9	94.9
ITEM34	.50982	34	.37440	0.9	95.8
ITEM35	.44169	35	.37440	0.9	96.7
ITEM36	.64795	36	.37440	0.9	97.6
ITEM37	.48772	37	.37440	0.9	98.5
ITEM38	.37772	38	.37440	0.9	99.4
ITEM39	.65884	39	.24089	0.6	99.9
ITEM40		40	.24089	0.6	100.0

Table Q.3
 Varimax Rotation of Three Factors^a: Males
 (n = 351)

Item and Subscale	Rotated Factor ^b			Item and Subscale	Rotated Factor ^b		
	1	2	3		1	2	3
01 B	53	15	12	21 D	09	51	16
02 D	05	57	-08	22 B	27	30	02
03 B	59	04	-05	23 B	58	-02	07
04 D	-01	63	07	24 B	66	-01	-06
05 B	69	02	-04	25 B	44	08	20
06 D	10	56	15	26 D	06	44	10
07 D	05	62	19	27 D	-09	72	18
08 D	04	30	24	28 D	05	28	65
09 D	14	06	62	29 B	32	11	17
10 B	55	04	-03	30 B	51	-21	17
11 B	41	04	-15	31 B	55	13	00
12 D	-02	67	22	32 B	62	-01	04
13 D	03	65	10	33 B	60	11	-01
14 B	66	09	01	34 B	54	-11	-03
15 D	-20	35	40	35 B	67	06	-02
16 D	-04	50	21	36 D	08	58	19
17 D	-01	31	63	37 D	05	22	72
18 B	43	01	13	38 B	54	07	13
19 B	36	05	01	39 D	08	22	49
20 D	20	50	10	40 D	03	20	78

Note. Decimal points omitted.

^aThese three factors accounted for 39.7% of the total variance.

^bValues >.29 have been entered in bold type.

Table Q.4
 Varimax Rotation of Four Factors^a: Males
 (n = 351)

Item and Subscale	Rotated Factor ^b				Item and Subscale	Rotated Factor ^b			
	1	2	3	4		1	2	3	4
01 B	47	14	13	24	21 D	-01	50	15	24
02 D	04	57	-07	03	22 B	14	28	01	32
03 B	66	05	-03	00	23 B	40	-04	05	50
04 D	01	63	07	-04	24 B	67	-01	-05	14
05 B	73	03	-03	10	25 B	45	09	21	08
06 D	09	56	15	06	26 D	06	44	10	01
07 D	09	62	20	-04	27 D	-06	72	19	-07
08 D	07	30	30	-03	28 D	06	28	66	-02
09 D	16	06	63	-01	29 B	22	09	17	27
10 B	38	02	-05	49	30 B	49	-21	18	15
11 B	31	03	-16	30	31 B	50	13	00	24
12 D	-04	67	22	06	32 B	65	-01	05	09
13 D	04	65	11	-02	33 B	57	11	00	20
14 B	68	10	03	12	34 B	58	-11	-02	04
15 D	-20	35	40	-04	35 B	65	06	-01	21
16 D	-05	50	21	03	36 D	06	58	19	07
17 D	-01	31	63	01	37 D	01	22	72	10
18 B	16	-04	11	70	38 B	35	05	12	52
19 B	13	03	-02	59	39 D	05	22	49	08
20 D	08	49	09	29	40 D	-02	19	78	12

Note. Decimal points omitted.

^aThese four factors accounted for 44.5% of the total varia. ce.

^bValues >.29 have been entered in **bold** type.

APPENDIX R
FACTOR ANALYSIS TABLES:
DEPTH AND BREADTH SUBSCALES

- Table R.1 Correlation Matrix: Depth Subscale
Table R.2 Table of Principal Factors: Depth Subscale
Table R.3 Varimax Rotation of Two Factors: Depth Subscale
Table R.4 Varimax Rotation of Three Factors: Depth Subscale
Table R.5 Correlation Matrix: Breadth Subscale
Table R.6 Table of Principal Factors: Breadth Subscale
Table R.7 Varimax Rotation of Two Factors: Breadth Subscale
Table R.8 Varimax Rotation of Three Factors: Breadth Subscale
Table R.9 Varimax Rotation of Four Factors: Breadth Subscale
Table R.10 Varimax Rotation of Five Factors: Breadth Subscale

Table R.1
Correlation Matrix: Depth Subscale

ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16															
1																														
0.45	1																													
0.32	0.28	1																												
0.18	0.15	0.12	1																											
0.25	0.22	0.18	0.15	1																										
0.35	0.32	0.28	0.25	0.22	1																									
0.42	0.38	0.35	0.32	0.28	0.25	1																								
0.38	0.35	0.32	0.28	0.25	0.22	0.18	1																							
0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	1																						
0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	1																					
0.40	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	1																				
0.30	0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	0.05	0.03	1																			
0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	0.05	1																		
0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	1																	
0.50	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	1																
0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	1															
0.60	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	1														
0.65	0.62	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	1													
0.70	0.68	0.65	0.62	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	1											
0.75	0.72	0.68	0.65	0.62	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	1									
0.80	0.78	0.75	0.72	0.68	0.65	0.62	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	1						
0.85	0.82	0.78	0.75	0.72	0.68	0.65	0.62	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	0.05	0.03	1			
0.90	0.88	0.85	0.82	0.78	0.75	0.72	0.68	0.65	0.62	0.58	0.55	0.52	0.48	0.45	0.42	0.38	0.35	0.32	0.28	0.25	0.22	0.18	0.15	0.12	0.10	0.08	0.05	0.03	0.01	1

Table R.2
Table of Principal Factors: Depth Subscale

VARIABLE	EST. COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
ITEM02	.31615	1	6.21237	31.0	31.0
ITEM04	.40468	3	2.57745	12.0	43.0
ITEM05	.35684	3	1.20799	5.6	48.6
ITEM07	.40090	4	.97773	4.6	53.2
ITEM08	.26431	5	.95654	4.5	57.7
ITEM09	.45215	6	.87988	4.1	61.8
ITEM12	.47255	7	.76680	3.6	65.4
ITEM13	.40116	8	.72346	3.4	68.8
ITEM15	.30613	9	.69762	3.3	72.1
ITEM17	.31201	10	.63536	3.0	75.1
ITEM20	.43736	12	.52898	2.5	77.6
ITEM21	.35560	13	.51222	2.4	80.0
ITEM27	.20028	14	.49715	2.3	82.3
ITEM28	.51605	15	.47362	2.2	84.5
ITEM36	.48954	16	.43327	2.0	86.5
ITEM37	.35692	17	.40269	1.9	88.4
ITEM38	.63409	18	.38253	1.8	90.2
ITEM40	.65221	20	.22831	1.1	91.3

Table R.3
 Varimax Rotation of Two Factors^a: Depth Subscale Items
 (N = 609)

Item	Rotated Factor ^b	
	1	2
02	55	-05
04	65	10
06	58	10
07	57	24
08	29	21
09	05	66
12	61	30
13	63	15
15	29	43
16	52	14
17	26	62
20	50	12
21	54	07
26	40	12
27	67	26
28	17	72
36	54	21
37	12	80
39	17	52
40	08	84

Note. Decimal points omitted.

^aThese two factors accounted for 43.9% of the total variance.

^bValues >.29 have been entered in **bold** type.

Table R.4
 Varimax Rotation of Three Factors^a: Depth Subscale Items
 (N = 609)

Item	Rotated Factor ^b		
	1	2	3
02	49	-07	25
04	60	07	26
06	51	07	30
07	45	20	51
08	15	16	50
09	-05	65	33
12	56	27	26
13	55	12	35
15	28	42	11
16	55	14	01
17	28	62	02
20	51	12	07
27	72	26	02
28	17	71	10
36	54	20	09
37	15	81	-01
39	11	50	25
40	11	84	02

Note. Decimal points omitted.

^aThese three factors accounted for 50.0% of the total variance.

^bValues >.29 have been entered in bold type.

Table R.5

Correlation Matrix: Breadth Subscale

ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20
1.0000	0.2150	0.1850	0.1550	0.1250	0.1000	0.0850	0.0750	0.0650	0.0550	0.0450	0.0350	0.0250	0.0150	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000
0.2150	1.0000	0.1500	0.1200	0.0900	0.0700	0.0550	0.0450	0.0350	0.0250	0.0150	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1850	0.1500	1.0000	0.0800	0.0600	0.0450	0.0350	0.0250	0.0150	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1550	0.1200	0.0800	1.0000	0.0500	0.0350	0.0250	0.0150	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1250	0.0900	0.0600	0.0500	1.0000	0.0400	0.0300	0.0200	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1000	0.0700	0.0450	0.0350	0.0400	1.0000	0.0300	0.0200	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0850	0.0550	0.0350	0.0250	0.0300	0.0300	1.0000	0.0200	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0750	0.0450	0.0250	0.0150	0.0200	0.0200	0.0200	1.0000	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0650	0.0350	0.0150	0.0050	0.0100	0.0100	0.0100	0.0100	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0550	0.0250	0.0050	0.0000	0.0050	0.0050	0.0050	0.0050	0.0050	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0450	0.0150	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0350	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0150	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

Table R.6
Table of Principal Factors: Breadth Subscale

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
ITEM01	.32244	1	9.37635	31.9	31.9
ITEM03	.42299	3	1.81283	9.1	40.9
ITEM05	.51425	3	1.07978	5.4	46.3
ITEM10	.33265	4	1.05463	5.3	51.6
ITEM11	.22471	5	1.01247	5.1	56.7
ITEM14	.40255	6	.91632	4.0	60.7
ITEM16	.37810	7	.79032	4.0	64.7
ITEM19	.21856	8	.75961	3.8	68.5
ITEM23	.18056	9	.70759	3.5	72.0
ITEM25	.39534	10	.68043	3.4	75.4
ITEM27	.43937	11	.63583	3.1	78.5
ITEM28	.30893	12	.61022	3.1	81.6
ITEM29	.18655	13	.54546	2.7	84.3
ITEM30	.20621	14	.52306	2.6	86.9
ITEM31	.25232	15	.47184	2.4	89.3
ITEM32	.35243	16	.45356	2.3	91.6
ITEM33	.37589	17	.43733	2.1	93.7
ITEM34	.38358	18	.41698	2.1	95.8
ITEM35	.47862	19	.38488	2.1	97.9
ITEM38	.35681	20	.35082	1.8	100.0

Table R.7
 Varimax Rotation of Two Factors^a: Breadth Subscale Items
 (N = 609)

Item	Rotated Factor ^b	
	1	2
01	46	31
03	60	06
05	70	23
10	18	52
11	23	32
14	63	20
18	09	75
19	06	63
22	12	36
23	39	49
24	65	21
25	49	20
29	24	31
30	43	27
31	37	30
32	61	18
33	56	24
34	57	09
35	65	27
38	27	54

Note. Decimal points omitted.

^aThese two factors accounted for 40.9% of the total variance.

^bValues >.29 have been entered in bold

Table R.8
 Varimax Rotation of Three Factors^a: Breadth Subscale Items
 (N = 609)

Item	Rotated Factor ^b		
	1	2	3
01	56	23	04
03	30	09	70
05	63	19	34
10	12	55	19
11	23	31	10
14	55	17	32
18	22	71	-09
19	04	67	09
22	13	36	07
23	47	43	05
24	60	16	28
25	53	14	12
29	30	27	02
30	40	24	20
31	33	28	19
32	54	14	29
33	54	20	23
34	30	12	61
35	66	20	21
38	28	52	12

Note. Decimal points omitted.

^aThese three factors accounted for 46.3% of the total variance.

^bValues >.29 have been entered in **bold** type.

Table R.9
 Varimax Rotation of Four Factors^a: Breadth Subscale Items
 (N = 609)

Item	Rotated Factor ^b			
	1	2	3	4
01	55	20	03	13
03	33	05	70	06
05	63	14	32	14
10	06	36	19	59
11	20	09	05	53
14	55	10	29	17
18	24	74	-08	15
19	05	71	14	12
22	13	29	06	20
23	48	42	05	13
24	61	14	27	08
25	53	08	09	14
29	29	15	-02	30
30	41	23	19	08
31	35	23	18	15
32	56	10	26	11
33	54	11	19	21
34	33	06	58	11
35	65	12	18	22
38	28	38	10	37

Note. Decimal points omitted.

^aThese four factors accounted for 51.6% of the total variance.

^bValues >.29 have been entered in bold type.

Table R.10
 Varimax Rotation of Five Factors^a: Breadth Subscale Items
 (N = 609)

Item	Rotated Factors ^b				
	1	2	3	4	5
01	59	20	06	14	-02
03	29	05	73	07	07
05	63	13	36	14	06
10	06	33	19	63	06
11	19	06	05	51	12
14	51	06	31	16	22
18	24	72	-08	17	14
19	04	69	13	15	14
22	06	24	03	18	36
23	49	41	07	15	10
24	61	13	30	09	07
25	49	04	10	11	25
29	28	12	-02	28	14
30	38	20	20	07	19
31	26	17	16	10	49
32	49	04	26	07	38
33	50	07	21	20	22
34	29	04	58	11	14
35	64	09	21	22	14
38	28	36	11	38	10

Note. Decimal points omitted.

^aThese five factors accounted for 56.7% of the total variance.

^bValues >.29 have been entered in bold type.

APPENDIX S
DISCRIMINANT FUNCTION ANALYSIS TABLES:
CURIOSITY STYLE BY NON-OCCUPATIONAL INDICES

- Table S.1 Non-occupational Indices: Means and Standard Deviations
- Table S.2 Curiosity Style by Non-occupational Indices: Means
- Table S.3 Univariate F -Ratios
- Table S.4 Canonical Discriminant Functions Table
- Table S.5 Standardized Function Coefficients.
- Table S.6 Non-occupational Indices: Means for Sex Groups
- Table S.7 Curiosity Style by Non-occupational Indices: Means - Females
- Table S.8 Curiosity Style by Non-occupational Indices: Means - Males
- Table S.9 Univariate F -Ratios - Females
- Table S.10 Univariate F -Ratios - Males
- Table S.11 Canonical Discriminant Functions Table - Females
- Table S.12 Canonical Discriminant Functions Table - Males
- Table S.13 Standardized Function Coefficients - Females
- Table S.14 Standardized Function Coefficients - Males

Table S.1
Non-occupational Indices:
Means and Standard Deviations (N = 609)

	EOR	E-I ^a	ARTMEC ^a	VARINTER ^a
<u>M</u>	30.53	55.59	50.40	44.32
<u>SD</u>	15.48	14.72	14.16	9.90

^aThese scale scores are standardized T-scores.

Table S.2
Curiosity Style by Non-occupational Indices: Means

Group Breadth/Depth	EOR	E-I	ARTMEC	VARINTER
LOW/LOW (<u>n</u> =166)	21.52	59.90	45.21	39.84
LOW/HIGH (<u>n</u> =132)	36.45	53.15	49.67	44.94
HIGH/LOW (<u>n</u> =141)	27.08	55.69	51.36	43.37
HIGH/HIGH (<u>n</u> =170)	37.61	53.21	55.25	48.99

Table S.3
Discriminant Function Analysis: Univariate F -Ratios
Curiosity Style by Non-occupational Indices

Non-occ. Index	$F(3,605)$	p
EOR	48.65	<.001
E-I	7.67	<.001
ARTMEC	15.46	<.001
VARINTER	27.85	<.001

Table S.4
 Canonical Discriminant Functions Table: Curiosity Style

by Non-occupational Indices

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	DIFFERENTIAL FUNCTION	WILKS	LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.35517	88.41	88.41	.5119449	0	.7048068		241.30	12	.001
2*	.07531	8.79	97.20	.1856772	1	.9551360		27.725	6	.001
3*	.01126	2.80	100.00	.1055375	2	.9888818		6.752	2	.0340

Table S.5
Standardized Function Coefficients:
Curiosity Style by Non-occupational Indices

Index	Function 1	Function 2	Function 3
EOR	-.71	.88	.07
E-I	.06	.39	1.22
ARTMEC	-.53	-.69	-.59
VARINTER	-.31	-.47	.93

Table S.6
Means for Sex Groups: Non-Occupational Indices

	<u>M</u>		<u>F(1,607)</u>	<u>p</u>
	Females	Males		
EOR	29.47	31.32	2.12	.15
E-I	49.54	60.05	86.40	<.001
VARINTER	43.54	44.89	2.75	.10
ARTMEC	37.59	59.82	921.36	<.001

Table S.7
 Curiosity Style by Non-occupational Indices: Means
 Females

Group Breadth/Depth	EOR	E-I	ARTMEC	VARINTER
LOW/LOW (<u>n</u> =69)	20.15	55.75	34.88	38.68
LOW/HIGH (<u>n</u> =58)	33.34	46.52	38.38	44.45
HIGH/LOW (<u>n</u> =62)	24.81	51.66	37.68	41.45
HIGH/HIGH (<u>n</u> =69)	39.73	43.96	39.55	49.52

Table S.8
 Curiosity Style by Non-occupational Indices: Means
 Males

Group Breadth/Depth	EOR	E-I	ARTMEC	VARINTER
LOW/LOW (<u>n</u> =94)	23.66	66.09	58.54	41.34
LOW/HIGH (<u>n</u> =81)	36.74	59.91	60.01	45.17
HIGH/LOW (<u>n</u> =79)	27.87	57.23	58.52	44.15
HIGH/HIGH (<u>n</u> =97)	37.01	56.60	61.95	48.68

Table S.9
Discriminant Function Analysis: Univariate F -Ratios
Curiosity Style by Non-occupational Indices
Females

Non-occ. Index	$F(3,254)$	p
EOR	24.65	<.001
E-I	10.09	<.001
ARTMEC	2.87	.037
VARINTER	17.15	<.001

Table S.10
Discriminant Function Analysis: Univariate F -Ratios
Curiosity Style by Non-occupational Indices
Males

Non-occ. Index	$F(3,347)$	p
EOR	21.46	<.001
E-I	10.51	<.001
ARTMEC	3.67	.013
VARINTER	9.98	<.001

Table S.11
 Canonical Discriminant Functions Table: Curiosity Style
 by Non-occupational Indices - Females

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AFTER FUNCTION	WILKS	LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.59227	96.00	96.00	.5308014	0	.7066782	.9838891	87.837	12	.0000
2*	.01236	3.03	99.03	.1195762	1	.9980686	.9980686	4.1093	2	.6619
3*	.00595	.97	100.00	.0627012	2			.99862	2	.6076

Table S.12
 Canonical Discriminant Functions Table: Curiosity Style
 by Non-occupational Indices - Males

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AEIER FUNCTION	WILKS LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.26660	76.42	76.42	.4587830	0	.7287158	109.50	12	.0000
2*	.06425	18.42	94.83	.2457077	1	.9229861	27.728	6	.0001
3*	.01803	5.17	100.00	.1330745	2	.9822912	6.1822	2	.0355

Table S.13
Standardized Function Coefficients:
Curiosity Style by Non-occupational Indices
Females

	Function 1
EOR	-.74
E-I	-.03
ARTMEC	-.31
VARINTER	-.42

Table S.14
Standardized Function Coefficients:
Curiosity Style by Non-occupational Indices
Males

	Function 1	Function 2	Function 3
EOR	-.82	.66	.55
E-I	.07	1.21	-.44
ARTMEC	-.55	-.18	-.39
VARINTER	-.23	.06	-.97

APPENDIX T
DISCRIMINANT FUNCTION ANALYSIS TABLES: CURIOSITY STYLE BY GENERAL
THEME SCALES

Table T.1 General Theme Scales: Means and Standard Deviations

Table T.2 Curiosity Style by General Theme Scales: Means

Table T.3 Univariate F -Ratios

Table T.4 Canonical Discriminant Functions Table

Table T.5 Standardized Function Coefficients

Table T.6 Intercorrelations Among General Theme Scales

Table T.1
 General Theme Scales:
 Means and Standard Deviations^a (N = 609)

	R	I	A	S	E	C
<u>M</u>	45.47	47.52	45.76	45.04	46.31	46.61
<u>SD</u>	9.43	11.08	8.74	9.77	8.99	8.95

^aAll scale scores are standardized T-scores.

Table T.2
Curiosity Style by General Theme Scales: Means^a

Group Breadth/Depth	R	I	A	S	E	C
LOW/LOW (<u>n</u> =166)	39.55	40.48	42.57	42.33	42.81	45.57
LOW/HIGH (<u>n</u> =132)	45.83	52.26	47.33	46.80	47.75	48.95
HIGH/LOW (<u>n</u> =141)	45.35	44.49	44.62	44.55	46.11	44.71
HIGH/HIGH (<u>n</u> =170)	51.07	53.23	48.62	46.71	48.78	47.38

^aAll scale scores are standardized T-scores.

Table T.3
Discriminant Function Analysis: Univariate F -Ratios
Curiosity Style by General Theme Scales

Theme	$F(3,605)$	p
R	52.45	<.001
I	64.32	<.001
A	16.89	<.001
S	7.73	<.001
E	14.76	<.001
C	6.46	<.001

Table T.4

Canonical Discriminant Functions Table: Curiosity Style

by General Theme Scales

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AFTER FUNCTION	WILKS LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.43821	84.47	84.47	.5519868	0	.6431716	266.13	18	.0000
2*	.07357	14.17	98.64	.2616758	1	.9280134	47.002	10	.0000
3*	.00704	1.36	100.00	.0836127	2	.9930089	4.2304	4	.3727

Table T.5
Standardized Function Coefficients:
Curiosity Style by General Theme Scales

Theme	Function 1	Function 2
R	-.52	.69
I	-.58	-.70
A	-.16	-.02
S	-.04	.03
E	-.17	.49
C	.09	-.72

Table T.6
 Intercorrelations Among General Theme Scales
 (N = 609)

Theme	R	I	A	S	E	C
R						
I	47					
A	17	37				
S	10	22	59			
E	22	30	52	56		
C	08	19	28	45	57	

Note. Decimal points omitted.

APPENDIX U
DISCRIMINANT FUNCTION ANALYSIS TABLES:
CURIOSITY STYLE BY BASIC INTEREST SCALES

Table U.1 Basic Interest Scales: Means and Standard
Deviations

Table U.2 Curiosity Style by Basic Interest Scales: Means

Table U.3 Univariate F -Ratios

Table U.4 Canonical Discriminant Functions Table

Table U.5 Standardized Function Coefficients

Table U.1
 Basic Interest Scales:
 Means and Standard Deviations^a (N = 609)

Basic Interest Scale	<u>M</u>	<u>SD</u>
Mechanical/Fixing	46.27	9.60
Electronics	49.28	10.29
Carpentry	43.63	9.53
Manual/Skilled Trades	46.50	8.96
Agriculture	45.41	10.70
Nature/Outdoors	44.06	10.73
Animal Service	50.24	9.92
Science	47.76	11.50
Numbers	49.18	9.21
Writing	45.66	9.80
Performing/Entertaining	47.65	9.66
Arts/Crafts	43.82	9.25
Social Service	45.83	9.73
Teaching	47.06	10.54
Child Care	48.45	10.84
Medical Service	47.36	9.80
Religious Activities	40.51	7.46
Business	45.78	9.54
Sales	50.86	8.46
Office Practices	47.67	9.71
Clerical/Clerking	46.62	8.48
Food Service	53.51	11.10

^aAll scale scores are standardized T-scores.

Table U.2
 Curiosity Style by Basic Interest Scales:
 Means^a (N = 609)

Basic Interest Scale	Curiosity Style			
	L/L	L/H	H/L	H/H
Mechanical/Fixing	41.55	46.49	45.49	51.35
Electronics	43.86	50.98	47.65	54.61
Carpentry	39.30	43.71	44.18	47.35
Manual/Skilled Trades	42.74	45.42	46.71	50.85
Agriculture	39.68	43.91	46.87	50.97
Nature/Outdoors	38.32	44.91	44.35	48.77
Animal Service	47.63	50.20	50.65	52.47
Science	41.16	51.71	45.23	53.23
Numbers	45.30	53.50	45.89	52.34
Writing	42.84	47.58	44.04	48.29
Performing/Entertaining	44.38	48.27	47.52	50.48
Arts/Crafts	41.10	45.30	42.87	46.12
Social Service	42.59	47.21	45.57	48.12
Teaching	44.93	48.33	46.75	48.41
Child Care	47.95	49.90	47.73	48.41
Medical Service	44.80	50.14	46.38	48.50
Religious Activities	38.68	42.04	39.43	42.02
Business	42.78	47.32	45.33	47.89
Sales	49.44	51.05	51.26	51.77
Office Practices	47.13	49.65	45.85	48.15
Clerical/Clerking	45.52	48.43	45.06	47.57
Food Service	54.16	52.31	54.11	53.32

^aAll scale scores are standardized T-scores.

Table U.3
 Discriminant Function Analysis: Univariate F -Ratios
 Curiosity Style by Basic Interest Scales

Basic Interest Scale	$F(3,605)$	p
Mechanical/Fixing	34.39	<.001
Electronics	39.06	<.001
Carpentry	22.37	<.001
Manual/Skilled Trades	26.83	<.001
Agriculture	39.07	<.001
Nature/Outdoors	31.04	<.001
Animal Service	6.97	<.001
Science	47.28	<.001
Numbers	38.08	<.001
Writing	12.29	<.001
Performing/Entertaining	12.02	<.001
Arts/Crafts	10.33	<.001
Social Service	10.68	<.001
Teaching	3.93	.008
Child Care	1.11	.34
Medical Service	8.90	<.001
Religious Activities	8.84	<.001
Business	9.89	<.001
Sales	2.35	.07
Office Practices	3.85	.01
Clerical/Clerking	5.34	.001
Food Service	0.85	.47

Table U.4
 Canonical Discriminant Functions Table: Curiosity Style

by Basic Interest Scales
 (Stepwise entry of variables into the analysis: Method - WILKS)

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AFIER FUNCTION	WILKS LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.52176	72.14	72.14	.5855494	0	.5445383	363.17	51	.0000
2*	.17089	23.63	95.76	.3820326	1	.8286591	112.30	32	.0000
3*	.03064	4.24	100.00	.1724274	2	.9702688	18.034	15	.2609

Table U.5
Standardized Function Coefficients:
Curiosity Style by Basic Interest Scales

Basic Interest Scale	Function 1	Function 2
Mechanical/Fixing	-.37	-.02
Electronics	-.37	-.13
Carpentry	.35	-.10
Manual/Skilled Trades	-.18	.50
Agriculture	.07	.64
Nature/Outdoors	-.32	-.01
Animal Service	*	*
Science	-.21	-.10
Numbers	-.30	-.32
Writing	-.27	-.10
Performing/Entertaining	*	*
Arts/Crafts	-.14	-.30
Social Service	-.34	.16
Teaching	-.18	.35
Child Care	.36	-.34
Medical Service	-.04	-.33
Religious Activities	*	*
Business	.15	.26
Sales	*	*
Office Practices	*	*
Clerical/Clerking	.11	-.61
Food Service	.14	.42

* After 17 steps the F level was insufficient for further computation. The scales marked were not in the analysis at the end of step 17.

APPENDIX V
 DISCRIMINANT FUNCTION ANALYSIS TABLES:
 FEMALE AND MALE GROUPS

Table V.1 General Theme Scales: Means for Female and Male
 Groups

Curiosity Style by General Theme Scales: FEMALES

- Table V.2 General Theme Scales: Means
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Table V.1
 General Theme Scales^a:
 Means for Female and Male Groups

Mean	R	I	A	S	E	C
Females	41.02	44.62	47.73	49.71	45.90	48.15
Males	48.74	49.65	44.32	41.60	46.61	45.47
<u>F</u> (1,607)	119.03	32.15	23.42	123.02	0.93	13.63
<u>p</u>	<.001	<.001	<.001	<.001	.34	<.001

^aAll scale scores are standardized T-scores.

Table V.2
 Curiosity Style by General Theme Scales: Means^a
 Females

Group Breadth/Depth	R	I	A	S	E	C
LOW/LOW (<u>n</u> =69)	35.41	36.86	44.45	45.32	42.45	46.49
LOW/HIGH (<u>n</u> =58)	41.79	48.52	48.67	51.93	47.16	50.83
HIGH/LOW (<u>n</u> =62)	40.11	41.08	45.39	48.18	44.34	45.86
HIGH/HIGH (<u>n</u> =69)	46.80	52.30	52.30	53.61	49.70	49.62

^aAll scale scores are standardized T-scores.

Table V.3
Discriminant Function Analysis: Univariate F -Ratios
Curiosity Style by General Theme Scales
Females

Theme	$F(3,254)$	p
R	24.60	<.001
I	35.81	<.001
A	10.66	<.001
S	10.95	<.001
E	8.63	<.001
C	3.94	.009

Table V.4

Canonical Discriminant Functions Table: Curiosity Style

by General Theme Scales - Females

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	BEFORE FUNCTION	AFTER FUNCTION	WILKS LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	5.1340	87.62	87.62	.5824406	-	0	.6156283	122.25	18	.0000
2*	.05913	10.89	97.71	.2362863	-	1	.9316935	17.829	10	.0579
3*	.01339	2.23	100.00	.1149477	-	2	.9867870	3.3519	4	.5006

Table V.5
Standardized Function Coefficients:
Curiosity Style by General Theme Scales
Females

Theme	Function 1
R	-.40
I	-.68
A	.03
S	-.07
E	-.18
C	.05

Table V.6
Curiosity Style by Basic Interest Scales
Means^a: Females ($n = 258$)

Basic Interest Scale	Curiosity Style			
	L/L	L/H	H/L	H/H
Mechanical/Fixing	37.54	41.98	40.27	45.70
Electronics	38.49	44.59	41.73	47.36
Carpentry	36.03	40.31	39.27	44.59
Manual/Skilled Trades	39.70	42.29	41.47	45.64
Agriculture	36.62	41.95	42.00	49.23
Nature/Outdoors	37.75	45.98	43.98	51.61
Animal Service	48.25	52.19	52.26	57.49
Science	37.99	48.45	43.02	52.81
Numbers	43.10	51.95	44.37	51.06
Writing	44.30	48.74	44.92	51.59
Performing/Entertaining	46.02	50.95	47.92	55.91
Arts/Crafts	45.23	47.43	45.76	52.23
Social Service	45.06	51.88	48.95	54.07
Teaching	47.59	52.76	50.55	54.35
Child Care	53.07	57.08	53.69	56.81
Medical Service	46.88	53.91	48.58	53.91
Religious Activities	39.44	42.90	39.82	45.49
Business	42.64	47.33	43.84	49.81
Sales	49.55	51.26	50.69	51.77
Office Practices	48.46	51.97	48.37	50.71
Clerical/Clerking	45.86	49.98	45.18	49.22
Food Service	58.75	59.33	59.16	61.68

^aAll scale scores are standardized I-scores.

Table V.7
 Discriminant Function Analysis: Univariate F-Ratios
 Curiosity Style by Basic Interest Scales
 Females

Basic Interest Scale	<u>F</u> (3,254)	<u>p</u>
Mechanical/Fixing	14.33	<.001
Electronics	21.70	<.001
Carpentry	12.84	<.001
Manual/Skilled Trades	8.20	<.001
Agriculture	21.88	<.001
Nature/Outdoors	23.66	<.001
Animal Service	9.63	<.001
Science	27.93	<.001
Numbers	16.53	<.001
Writing	7.62	<.001
Performing/Entertaining	14.11	<.001
Arts/Crafts	8.23	<.001
Social Service	11.93	<.001
Teaching	5.36	.001
Child Care	2.82	.04
Medical Service	8.37	<.001
Religious Activities	9.12	<.001
Business	7.77	<.001
Sales	0.87	.456
Office Practices	1.66	.177
Clerical/Clerking	4.44	.005
Food Service	1.39	.25

Table V.8

Canonical Discriminant Functions Table: Curiosity Style

by Basic Interest Scales - Females

(Stepwise entry of variables into the analysis: Method - WILKS)

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AFTER FUNCTION	WILKS	LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.61188	74.11	74.11	.6151222	0	.5070043		168.11	45	.0000
2*	.14265	17.79	91.87	.5576226	2	.8172302		49.954	28	.0065
3*	.06713	8.13	100.00	.2508454	-	.9370766		16.085	13	.2446

Table V.9
Standardized Function Coefficients:
Curiosity Style by Basic Interest Scales
Females

Basic Interest Scale	Function 1	Function 2
Mechanical/Fixing	*	*
Electronics	-.51	.18
Carpentry	*	*
Manual/Skilled Trades	.19	-.33
Agriculture	-.11	-.57
Nature/Outdoors	-.26	-.08
Animal Service	*	*
Science	-.44	.04
Numbers	-.08	.49
Writing	*	*
Performing/Entertaining	*	*
Arts/Crafts	.06	.12
Social Service	-.29	-.16
Teaching	-.21	-.99
Child Care	.41	1.03
Medical Service	*	*
Religious Activities	-.04	.23
Business	-.09	.23
Sales	.11	-.51
Office Practices	-.16	-.43
Clerical/Clerking	.05	.95
Food Service	*	*

* After 17 steps the F level was insufficient for further computation. The scales marked were not in the analysis at the end of step 17.

Table V.10
 Curiosity Style by General Theme Scales: Means^a
 Males

Group Breadth/Depth	R	I	A	S	E	C
LOW/LOW (<u>n</u> =94)	44.37	44.28	40.56	37.39	43.40	44.11
LOW/HIGH (<u>n</u> =81)	49.22	53.77	45.78	42.16	47.12	47.25
HIGH/LOW (<u>n</u> =79)	47.98	46.03	44.35	43.08	47.62	43.96
HIGH/HIGH (<u>n</u> =97)	53.20	54.36	46.71	44.01	48.46	46.54

^aAll scale scores are standardized I-scores.

Table V.11
Discriminant Function Analysis: Univariate F -Ratios
Curiosity Style by General Theme Scales
Males

Theme	$F(3,347)$	p
R	20.69	<.001
I	27.80	<.001
A	12.12	<.001
S	13.18	<.001
E	6.38	<.001
C	3.70	.01

Table V.12

Canonical Discriminant Functions Table: Curiosity Style

by General Theme Scales - Males

FUNCTION	EIGENVALUE	PERCENT-OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	AEIER FUNCTION	MILKS	LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.37569	76.35	76.36	.5225824	0	.6505443	14.6733	16		.0000
2*	.10607	21.95	97.92	.3092729	1	.8949478	38.239	10		.0000
3*	.01023	2.09	100.00	.1006276	2	.9898741	3.5113	4		.4792

Table V.13
Standardized Function Coefficients:
Curiosity Style by General Theme Scales
Males

Theme	Function 1	Function 2
R	-.54	-.17
I	-.55	.56
A	-.24	-.02
S	-.24	-.67
E	.00	-.51
C	.11	.87

Table V.14
 Curiosity Style by Basic Interest Scales
 Means^a: Males (n = 351)

Basic Interest Scale	Curiosity Style			
	L/L	L/H	H/L	H/H
Mechanical/Fixing	46.52	50.28	48.18	54.12
Electronics	50.44	55.82	50.58	58.33
Carpentry	43.76	46.30	46.11	48.74
Manual/Skilled Trades	47.30	49.20	49.00	52.65
Agriculture	42.55	45.73	50.20	51.81
Nature/Outdoors	37.88	43.56	44.68	47.97
Animal Service	45.37	47.67	50.15	50.97
Science	44.10	52.96	46.08	54.29
Numbers	47.86	54.14	46.66	52.75
Writing	41.13	46.15	43.85	46.52
Performing/Entertaining	41.99	45.01	47.85	48.34
Arts/Crafts	36.84	42.47	41.15	43.51
Social Service	38.59	42.99	44.13	45.66
Teaching	40.46	44.42	45.52	45.71
Child Care	40.37	44.06	45.06	44.95
Medical Service	41.71	45.80	45.14	46.90
Religious Activities	37.43	40.63	38.92	40.93
Business	42.82	46.43	46.38	47.31
Sales	49.59	50.69	51.82	51.61
Office Practices	44.71	47.93	44.52	47.11
Clerical/Clerking	44.71	47.31	44.92	46.88
Food Service	48.45	46.31	51.27	49.64

^aAll scale scores are standardized T-scores.

Table V.15
 Discriminant Function Analysis: Univariate F-Ratios
 Curiosity Style by Basic Interest Scales
 Males

Basic Interest Scale	<u>F</u> (3,347)	<u>p</u>
Mechanical/Fixing	13.72	<.001
Electronics	17.32	<.001
Carpentry	4.79	<.001
Manual/Skilled Trades	6.68	<.001
Agriculture	16.85	<.001
Nature/Outdoors	17.13	<.001
Animal Service	7.79	<.001
Science	21.34	<.001
Numbers	17.21	<.001
Writing	7.41	<.001
Performing/Entertaining	11.10	<.001
Arts/Crafts	14.37	<.001
Social Service	13.50	<.001
Teaching	6.72	<.001
Child Care	6.42	<.001
Medical Service	7.10	<.001
Religious Activities	5.52	.001
Business	4.53	.004
Sales	1.30	.27
Office Practices	3.55	.02
Clerical/Clerking	2.51	.06
Food Service	3.59	.01

Table V.16

Canonical Discriminant Functions Table: Curiosity Style

by Basic Interest Scales - Males

(Stepwise entry of variables into the analysis: Method - WILKS)

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	- AFTER FUNCTION	WILKS LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
1*	.47443	66.31	66.31	.5672475	0	.5434925	208.23	39	.0000
2*	.20831	29.11	95.42	.4152078	1	.8013392	75.632	24	.0000
3*	.03277	4.58	100.00	.1781407	2	.9682659	11.013	11	.4422

Table V.17
 Standardized Function Coefficients:
 Curiosity Style by Basic Interest Scales
 Males

Basic Interest Scale	Function 1	Function 2
Mechanical/Fixing	-.59	.20
Electronics	-.32	-.02
Carpentry	.34	-.23
Manual/Skilled Trades	*	*
Agriculture	-.02	.67
Nature/Outdoors	*	*
Animal Service	*	*
Science	-.32	-.23
Numbers	-.15	-.21
Writing	-.28	-.04
Performing/Entertaining	.11	.53
Arts/Crafts	-.27	-.23
Social Service	-.42	.19
Teaching	*	*
Child Care	*	*
Medical Service	*	*
Religious Activities	*	*
Business	*	*
Sales	.25	.19
Office Practices	*	*
Clerical/Clerking	-.05	-.55
Food Service	.27	.25

* After 13 steps the F level was insufficient for further computation. The scales marked were not in the analysis at the end of step 13.

Table V.18
 Correlations after Rotation^a
 Curiosity Style by General Theme Scales
 Females

Theme	Rotated Function 1	Rotated Function 2
R-Theme	.82	-.19
I-Theme	.80	.50
A-Theme	.45	.18
S-Theme	.45	.25
E-Theme	.42	.15
C-Theme	.08	.59

^aCorrelations between rotated canonical discriminant functions and discriminating variables.

Table V.19
 Group Centroids (after Rotation)
 Cusiosity Style by General Theme Scales
 Females

Group Breadth/Depth	Rotated Function	
	1	2
LOW/LOW	-.91	-.17
LOW/HIGH	.23	.44
HIGH/LOW	-.23	-.38
HIGH/HIGH	.92	.14

Table V.20
 Correlations after Rotation^a
 Curiosity Style by General Theme Scales
 Males

Theme	Rotated Function 1	Rotated Function 2
R-Theme	.61	.33
I-Theme	.27	.85
A-Theme	.47	.24
S-Theme	.67	-.03
E-Theme	.45	.00
C-Theme	-.01	.38

^aCorrelations between rotated canonical discriminant functions and discriminating variables.

Table V.21
Group Centroids (after Rotation)
Cusiosity Style by General Theme Scales
Males

Group Breadth/Depth	Rotated Function	
	1	2
LOW/LOW	-.77	-.41
LOW/HIGH	.01	.47
HIGH/LOW	.21	-.54
HIGH/HIGH	.57	.45

APPENDIX W

DIFFERENTIAL EMOTIONS SCALE

Differential Emotions Scale: Items

Differential Emotions Scale: Scoring Key

Table W.1 DES Item Responses for Four Curiosity Type by
Intensity Situations

DIRECTIONS

This scale consists of a number of words which describe different emotions or feelings. Please indicate the extent to which each word describes the way you feel when.....

Record your answers by circling the appropriate number on the five-place scale following each word.

	Not at all	Slightly	Moderately	Considerably	Very strongly
1 Repentant	1	2	3	4	5
2 Delighted	1	2	3	4	5
3 Feeling of Distaste	1	2	3	4	5
4 Downhearted	1	2	3	4	5
5 Surprised	1	2	3	4	5
6 Fatigued	1	2	3	4	5
7 Contemptuous	1	2	3	4	5
8 Sheepish	1	2	3	4	5
9 Attentive	1	2	3	4	5
10 Scared	1	2	3	4	5
11 Enraged	1	2	3	4	5
12 Happy	1	2	3	4	5
13 Scornful	1	2	3	4	5
14 Concentrating	1	2	3	4	5
15 Amazed	1	2	3	4	5
16 Fearful	1	2	3	4	5
17 Sluggish	1	2	3	4	5

18	Angry	1	2	3	4	5
19	Sad	1	2	3	4	5
20	Guilty	1	2	3	4	5
21	Bashful	1	2	3	4	5
22	Disgusted	1	2	3	4	5
23	Joyful	1	2	3	4	5
24	Feeling of Revulsion	1	2	3	4	5
25	Disdainful	1	2	3	4	5
26	Blameworthy	1	2	3	4	5
27	Astonished	1	2	3	4	5
28	Alert	1	2	3	4	5
29	Mad	1	2	3	4	5
30	Discouraged	1	2	3	4	5
31	Shy	1	2	3	4	5
32	Sleepy	1	2	3	4	5
33	Afraid	1	2	3	4	5

Scoring key:

	Emotions	Items
I-E	interest-excitement	9, 14, 28
E-J	enjoyment-joy	2, 12, 27
S-S	surprise-startle	5, 15, 23
D-A	distress-anguish	4, 19, 30
A-R	anger-rage	11, 18, 29
D-R	disgust-revulsion	3, 22, 24
C-S	contempt-scorn	7, 13, 25
S-H(S)	shame-humiliation (shyness)	8, 21, 31
S-H(G)	shame-humiliation (guilt)	1, 20, 26
F-T	fear-terror	10, 16, 33
F-S	fatigue-sleep	6, 17, 32

Table W.1
Means and Standard Deviations for Item Responses
in Four Curiosity Type by Intensity Situations

Item	Situation Type by Intensity							
	High Depth		Low Depth		High Breadth		Low Breadth	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
repentant	1.39	0.71	1.80	1.07	1.30	0.66	2.24	1.38
delighted	3.07	1.08	1.83	0.93	4.00	1.12	2.04	1.09
distaste	1.50	0.78	2.00	1.10	1.30	0.73	2.31	1.24
downhearted	1.40	0.69	1.67	0.79	1.22	0.59	1.84	1.07
surprised	2.80	1.07	2.02	1.09	3.02	1.34	2.98	1.34
fatigued	1.65	0.82	2.11	1.23	1.85	1.17	2.07	1.25
contemptuous	1.36	0.72	1.47	0.73	1.24	0.80	1.59	1.02
sheepish	1.30	0.59	1.52	0.91	1.33	0.67	1.89	1.27
attentive	3.82	0.96	3.02	1.16	4.40	0.69	3.73	1.39
scared	1.31	0.67	1.20	0.69	2.48	1.21	3.40	1.18
enraged	1.30	0.76	1.41	0.88	1.06	0.33	1.80	1.25
happy	2.96	1.05	2.15	1.01	3.91	1.03	1.96	1.07
scornful	1.20	0.58	1.48	0.78	1.07	0.33	1.51	0.94
concentrating	3.91	0.99	3.38	1.15	4.02	1.04	3.78	1.41
amazed	2.87	1.20	2.13	1.22	3.07	1.31	2.93	1.42
fearful	1.35	0.67	1.22	0.73	2.22	1.13	3.16	1.33
sluggish	1.24	0.52	1.70	0.94	1.22	0.70	1.33	0.64
angry	1.20	0.55	1.52	0.81	1.13	0.50	1.80	1.22
sad	1.26	0.65	1.37	0.93	1.07	0.25	1.64	1.05
guilty	1.26	0.65	1.15	0.42	1.04	0.21	1.40	0.92
bashful	1.22	0.48	1.22	0.66	1.35	0.71	1.42	0.84
disgusted	1.20	0.54	1.28	0.78	1.00	0.00	1.60	1.10
joyful	2.61	1.11	1.67	0.87	3.67	1.21	1.89	1.07
revulsion	1.22	0.59	1.30	0.79	1.09	0.35	1.84	1.24
disdainful	1.28	0.66	1.44	0.81	1.17	0.49	1.64	1.09
blameworthy	1.22	0.51	1.20	0.45	1.11	0.38	1.58	1.10
astonished	2.30	1.07	1.94	1.16	2.70	1.28	2.75	1.42
alert	3.63	1.22	3.07	1.27	4.28	0.81	3.89	1.30
mad	1.33	0.63	1.57	1.05	1.26	0.68	1.78	1.24
discouraged	1.33	0.60	1.91	1.07	1.26	0.54	1.93	1.18
shy	1.24	0.57	1.15	0.47	1.24	0.57	1.51	0.97
sleepy	1.24	0.60	1.65	0.97	1.04	0.21	1.46	1.04
afraid	1.30	0.63	1.24	0.74	2.15	1.15	3.09	1.38

APPENDIX X

FACTOR STRUCTURE OF THE DES OVER FOUR CURIOSITY SITUATIONS

Table X.1 Correlation Matrix: High Depth Curiosity Situation

Table X.2 Table of Principal Factors: High Depth Curiosity Situation

Table X.3 Rotated Factor Structure: High Depth Curiosity Situation

Table X.4 Correlation Matrix: Low Depth Curiosity Situation

Table X.5 Table of Principal Factors: Low Depth Curiosity Situation

Table X.6 Rotated Factor Structure: Low Depth Curiosity Situation

Table X.7 Correlation Matrix: High Breadth Curiosity Situation

Table X.8 Table of Principal Factors: High Breadth Curiosity Situation

Table X.9 Rotated Factor structure: High Breadth Curiosity Situation

Table X.10 Correlation Matrix: Low Breadth Curiosity Situation

Table X.11 Table of Principal Factors: Low Breadth Curiosity Situation

Table X.12 Rotated Factor Structure: Low Breadth Curiosity Situation

Table X.13 Correlation Matrix: Combined Data

Table X.14 Table of Principal Factors: Combined Data

Table X.15 Rotated Factor Structure: Combined Data

Table X.1
Correlation Matrix: High Depth Curiosity Situation

	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	
1101	1.0000																				
1102	0.0000	1.0000																			
1103	0.0000	0.0000	1.0000																		
1104	0.0000	0.0000	0.0000	1.0000																	
1105	0.0000	0.0000	0.0000	0.0000	1.0000																
1106	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000															
1107	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000														
1108	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000													
1109	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000												
1110	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000											
1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000										
1112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000									
1113	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000								
1114	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000							
1115	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000						
1116	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000					
1117	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000				
1118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000			
1119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000		
1120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	

Table X.2

Table of Principal Factors: High Depth Curiosity Situation

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
I101	.94770	1	11.17927	33.9	33.9
I102	.96103	2	5.67660	15.4	49.3
I103	.98725	3	3.26176	9.9	59.1
I104	.98891	4	1.85983	5.6	64.6
I105	.91367	5	1.73143	5.2	70.0
I106	.86555	6	1.63994	4.4	74.4
I107	.93778	7	1.52094	4.0	78.4
I108	.92863	8	1.09414	3.0	81.7
I109	.91803	9	.99012	2.4	84.7
I110	.93945	10	.79823	2.4	87.1
I111	.99529	11	.64411	2.0	89.1
I112	.95498	12	.67795	1.7	90.8
I113	.99131	13	.47053	1.4	92.2
I114	.84855	14	.40376	1.2	93.4
I115	.92557	15	.35919	1.1	94.5
I116	.99948	16	.28385	.8	95.4
I117	.93449	17	.26546	.8	96.2
I118	.93743	18	.25551	.7	96.9
I119	.93547	19	.20592	.6	97.5
I120	.93667	20	.19326	.6	98.1
I121	.84873	21	.13434	.4	98.5
I122	.92850	22	.12278	.4	98.8
I123	.95808	23	.10474	.3	99.2
I124	.95942	24	.07200	.2	99.4
I125	.92014	25	.06904	.2	99.6
I126	.93333	26	.05166	.1	99.7
I127	.93070	27	.02403	.1	99.8
I128	.83123	28	.02480	.1	99.9
I129	.84903	29	.00777	.0	100.0
I130	.84903	30	.00238	.0	100.0
I131	.93524	31	.00113	.0	100.0
I132	.98844	32	.00024	.0	100.0
I133	.96800	33			100.0

Table X.3
Rotated Factor Structure of DES: I

		Rotated Factors ^a			
		1	2	3	4
93	angry A-R		80 happy E-J	82 sheepish S-H(S)	74 repentant S-H(G)
91	enraged A-R		78 delighted E-J	80 fatigued F-S	65 guilty S-H(G)
89	sad D-A		77 alert I-E	72 sluggish F-S	50 blameworthy S-H(G)
81	disgusted D-R		77 attentive I-E	58 disdainful C-S	43 disgusted D-R
75	mad A-R		74 joyful E-J	58 blameworthy S-H(G)	42 disdainful C-S
73	afraid F-T		73 concentrating I-E	55 contemptuous C-S	35 distaste D-R
68	discouraged D-A		55 amazed S-S	50 sleepy F-S	32 mad A-R
60	scornful C-S		50 astonished S-S	44 scornful C-S	
59	downhearted D-A	-45	distaste D-R	35 distaste D-R	
59	scared F-T	-31	downhearted D-A	30 downhearted D-A	
56	fearful F-T				
47	guilty S-H(G)				
43	blameworthy S-H(G)				
42	revulsion D-R				
42	sluggish F-S				
36	shy S-H(S)				
33	disdainful C-S				
-32	attentive I-E				

Note. Decimal points omitted.

^a Only values ≥ 30 have been included.

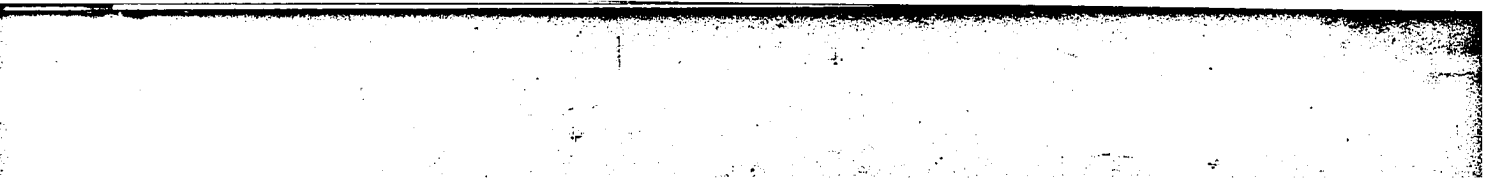


Table X.3

Rotated Factor Structure of DES: High Depth Curiosity Situation

		Rotated Factors ^a												
		4		5		6		7		8				
1	repentant	S-H(G)	75	scared	F-T	69	amazed	S-S	74	shy	S-H(S)	66	sleepy	F-S
5	guilty	S-H(G)	74	fearful	F-T	65	surprised	S-S	65	bashtul	S-H(S)	43	happy	E-J
9	blameworthy	S-H(G)	48	distaste	D-R	50	astonished	S-S	32	sheepish	S-H(S)	-30	discouraged	D-A
1	disgusted	D-R	42	downhearted	D-A	45	contemptuous	C-S	31	afraid	F-T			
2	disdainful	C-S	37	afraid	F-T	35	distaste	D-R						
3	distaste	D-R				31	revulsion	D-R						
2	mad	A-R												

Table X.4
Correlation Matrix: Low Depth Curiosity Situation

	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	
1201	1.00000																				
1202	0.00000	1.00000																			
1203	0.00000	0.00000	1.00000																		
1204	0.00000	0.00000	0.00000	1.00000																	
1205	0.00000	0.00000	0.00000	0.00000	1.00000																
1206	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000															
1207	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000														
1208	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000													
1209	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000												
1210	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000											
1211	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000										
1212	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000									
1213	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000								
1214	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000							
1215	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000						
1216	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000					
1217	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000				
1218	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000			
1219	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000		
1220	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	

Table X.5
Table of Principal Factors: Low Depth Curiosity Situation

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
I201	.84321	1	10.41476	31.6	31.6
I202	.88589	2	5.35478	16.2	47.8
I203	.81092	3	3.36506	10.2	58.0
I204	.60694	4	1.80430	5.5	63.5
I205	.84412	5	1.56738	4.7	68.2
I206	.88653	6	1.48247	4.5	72.7
I207	.90411	7	1.33810	4.1	76.7
I208	.91641	8	1.13515	3.4	80.1
I209	.95181	9	.93699	2.8	83.0
I210	.94617	10	.81627	2.5	85.4
I211	.94890	11	.75143	2.3	87.7
I212	.91641	12	.64866	2.0	89.7
I213	.91832	13	.50259	1.5	91.2
I214	.88279	14	.45199	1.4	92.6
I215	.98200	15	.36506	1.1	93.7
I216	.86328	16	.32236	1.0	94.7
I217	.96690	17	.30423	.9	95.6
I218	.90279	18	.25193	.8	96.3
I219	.90679	19	.22659	.7	97.0
I220	.97988	20	.17583	.5	97.5
I221	.90307	21	.13263	.4	98.0
I222	.93639	22	.11830	.4	98.3
I223	.92191	23	.10551	.3	98.7
I224	.86116	24	.09493	.3	98.9
I225	.89909	25	.07942	.2	99.2
I226	.93010	26	.07004	.2	99.4
I227	.88797	27	.05623	.2	99.6
I228	.85476	28	.04460	.1	99.7
I229	.85476	29	.02874	.1	99.8
I230	.85476	30	.01987	.1	99.8
I231	.85476	31	.01387	.1	99.9
I232	.85476	32	.01287	.1	100.0
I233	.85476	33	.00580	.0	100.0

Table X.6

Rotated Factor Structure of DES: LC

		Rotated Factors ^a											
		1	2	3	4								
94	afraid	F-T	86	astonished	S-S	80	contemptuous	C-S	71	sleepy	F-S	68	discouraged
93	sad	D-A	81	happy	E-J	78	sheepish	S-H(S)	60	sluggish	F-S	60	revulsion
89	fearful	F-T	78	amazed	S-S	61	fatigued	F-S	-46	attentive	I-E	46	repentant
87	scared	F-T	71	concentrating	I-E	60	disdainful	C-S	-41	alert	I-E	-37	concentrating
83	mad	A-R	70	alert	I-E	46	blameworthy	S-H(G)	-36	concentrating	I-E	-30	alert
82	enraged	A-R	70	joyful	E-J	45	downhearted	D-A	31	repentant	S-H(G)	30	sheepish
80	angry	A-R	67	surprised	S-S	40	sluggish	F-S					
80	disgusted	D-R	61	delighted	E-J	39	repentant	S-H(G)					
74	shy	S-H(S)	59	attentive	I-E	31	distaste	D-R					
74	discouraged	D-A											
51	sleepy	F-S											
50	revulsion	D-R											
44	guilty	S-H(G)											
43	blameworthy	S-H(G)											

Note. Decimal points omitted.

^aOnly values ≥ 30 have been included.

Table X.6

Rotated Factor Structure of DES: Low Depth Curiosity Situation

Rotated Factors ^a													
4		5		6		7		8					
sleepy	F-S	68	disdainful	C-S	79	distaste	D-R	81	bashful	S-H(S)	60	guilty	S-H(G)
sluggish	F-S	60	revulsion	D-R	-41	delighted	E-J	62	scornful	C-S	43	shy	S-H(S)
inattentive	I-E	46	repentant	S-H(G)	37	amazed	S-S	34	discouraged	D-A	32	blameworthy	S-H(G)
alert	I-E	-37	concentrating	I-E									
concentrating	I-E	-30	alert	I-E									
repentant	S-H(G)	30	sheepish	S-H(S)									

Table X.7
Correlation Matrix: High Breath Curiosity Situation

	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	
1301	1.00000																				
1302	0.22000	1.00000																			
1303	0.18000	0.15000	1.00000																		
1304	0.12000	0.10000	0.08000	1.00000																	
1305	0.09000	0.07000	0.06000	0.05000	1.00000																
1306	0.07000	0.05000	0.04000	0.03000	0.02000	1.00000															
1307	0.05000	0.03000	0.02000	0.01000	0.01000	0.01000	1.00000														
1308	0.03000	0.02000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000													
1309	0.02000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000												
1310	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000											
1311	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000										
1312	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000									
1313	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000								
1314	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000							
1315	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000						
1316	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000					
1317	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000				
1318	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000			
1319	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000		
1320	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	0.01000	1.00000	

Table X.8
Table of Principal Factors: High Breadth Curiosity Situation

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
I301	.75051	1	7.09084	25.0	25.0
I302	.75028		4.43318	13.9	38.8
I303	.76910	3	2.74596	8.6	47.4
I304	.48788	4	2.60039	8.1	55.5
I305	.72919	5	2.08191	6.3	61.8
I306	.55286	6	1.77664	5.3	67.1
I307	.73914	7	1.36594	4.3	71.9
I308	.53452	8	1.29872	4.1	75.9
I309	.72563		1.06764	3.3	79.3
I310	.83246	10	.85055	2.7	81.9
I311	.90015	11	.82726	2.6	84.5
I312	.73654	12	.77766	2.2	86.8
I313	.70914	13	.57559	1.8	88.6
I314	.66984	14	.55061	1.7	90.3
I315	.77033	15	.49174	1.5	91.8
I316	.83246	16	.43476	1.4	93.2
I317	.47318	17	.38923	1.1	94.4
I318	.90015	18	.30253	.9	95.3
I319	.53452	19	.26187	.8	96.1
I320	.65123	20	.23851	.7	96.9
I321	.50464	21	.21650	.7	97.6
I322		22	.19731	.6	98.2
I323	.79654	23	.15786	.5	98.7
I324	.34419	24	.10747	.3	99.0
I325	.61915	25	.08103	.3	99.3
I326	.79654	26	.07296	.2	99.5
I327	.77033	27	.05381	.2	99.7
I328	.72563	28	.04241	.1	99.8
I329	.66219	29	.03289	.1	99.9
I330	.53563	30	.01602	.0	99.9
I331	.50864	31	.01131	.0	100.0
I332	.42271	32	.00594	.0	100.0
I333	.72514	33	.00000	.0	100.0

Table X.9

Rotated Factor Structure of L&S: High breadth Cur1

		Rotated Factors ^a												
		1	2		3		4		5					
86	enraged	A-R	86	alert	I-E	81	tatigued	F-S	90	fearful	F-T	93	astonished	S-S
84	angry	A-R	78	attentive	I-E	69	sluggish	F-S	80	scared	F-T	75	surprised	S-S
73	distaste	D-R	72	concentrating	I-E	60	disdaintul	C-S	71	atraid	F-T	73	amazed	S-S
67	guilty	S-H(S)	38	delighted	E-J	60	repentant	S-H(G)						
62	discouraged	D-A	33	joytul	E-J	59	blameworthy	S-H(G)						
62	blameworthy	S-H(S)	33	sheepish	S-H(S)	36	mad	A-R						
-61	delighted	E-J				32	discouraged	D-A						
-59	happy	E-J												
52	sad	D-A												
-50	joytul	E-J												
49	downhearted	D-A												
47	repentant	S-H(G)												
47	sheepish	S-H(S)												
40	mad	A-R												
33	disdaintul	C-S												

Note. Decimal points omitted.

^aOnly values $> .30$ have been included.

Table X.9

Factor Structure of M&S: High Breadth Curiosity Situation

Rotated factors ^a		5		6		7		8		9					
F-T	93	astonished	S-S	74	shy	S-H(S)	83	contemptuous	C-S	67	revulsion	D-R	57	sad	D-A
F-T	75	surprised	S-S	73	sheepish	S-H(S)	62	scornful	C-S	-47	happy	E-J	51	sleepy	F-S
F-T	73	amazed	S-S	67	bashful	S-H(S)	31	blameworthy	S-H(G)	-45	delighted	E-J			
				33	sad	D-A				-41	joyful	E-J			
										33	mad	A-R			

Table X.10
Correlation Matrix: Low Breadth Curiosity Situation

	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	
1401	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
1402	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
1403	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1404	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1405	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1406	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1407	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1408	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1409	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1410	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1411	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1412	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1413	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1414	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
1415	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000
1416	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000
1417	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000
1418	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000
1419	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000
1420	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000

Table X.11
Table of Principal Factors: Low Breadth Curiosity Situation

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
I401	.91057	1	11.4389	34.6	34.6
I402	.94280	2	4.35877	13.2	47.8
I403	.95004	3	2.98374	9.0	56.8
I404	.95127	4	2.59500	7.9	64.7
I405	.93990	5	1.81202	5.5	70.2
I406	.97066	6	1.75352	5.1	75.3
I407	.98241	7	1.25404	3.8	79.1
I408	.92042	8	.98568	3.0	82.1
I409	.92525	9	.91262	2.8	84.9
I410	.97054	10	.68463	2.1	87.0
I411	.94815	11	.61054	1.9	88.9
I412	.98453	12	.55606	1.7	90.6
I413	.98578	13	.54694	1.7	92.3
I414	.93155	14	.45293	1.4	93.7
I415	.97369	15	.40800	1.2	94.9
I416	.97014	16	.34136	1.0	95.9
I417	.79138	17	.29459	.9	96.8
I418	.93992	18	.22881	.7	97.5
I419	.97549	19	.21374	.6	98.1
I420	.97213	20	.19079	.6	98.7
I421	.88952	21	.16118	.5	99.2
I422	.95591	22	.15042	.5	99.7
I423	.94275	23	.11729	.4	100.1
I424	.95312	24	.09118	.3	100.4
I425	.86408	25	.67694	2.2	102.6
I426	.86563	26	.07559	.2	102.8
I427	.92344	27	.04559	.1	102.9
I428	.92911	28	.62816	1.1	104.0
I429	.97656	29	.02694	.1	104.1
I430	.93887	30	.01603	.0	104.1
I431	.86856	31	.00813	.0	104.1
I432	.87477	32	.00573	.0	104.1
I433	.90850	33	.00274	.0	104.1

Table

Rotated Factor Structure of

		Rotated						
		1	2	3	4			
88	angry	A-R	78 concentrating	I-E	92 joyful	E-J	92 guilty	S-H(G)
79	enraged	A-R	75 afraid	F-T	91 happy	E-J	79 blameworthy	S-H(G)
78	sad	D-A	74 fearful	F-T	83 delighted	E-J	52 contemptuous	C-S
77	sleepy	F-S	74 alert	I-E	-44 distaste	D-R	45 scornful	C-S
73	fatigued	F-S	71 scared	F-T	40 attentive	I-E	44 distaste	D-R
73	mad	A-R	50 attentive	I-E	-36 afraid	F-T	37 sad	D-A
70	disdainful	C-S	40 revulsion	D-R	-31 revulsion	D-R	35 revulsion	D-R
68	discouraged	D-A	38 downhearted	D-A			31 shy	S-H(S)
63	scornful	C-S	38 discouraged	D-A				
58	contemptuous	C-S	33 astonished	S-S				
56	disgusted	D-R	32 mad	A-R				
48	repentant	S-H(G)						
45	downhearted	D-A						
42	sheepish	S-H(S)						
38	tearful	F-T						
34	distaste	D-R						

Note. Decimal points omitted.

^aOnly values ≥ 30 have been included.

Table X.12

Rotated Factor Structure of DES: Low Breadth Curiosity Situation

Rotated Factors ^a											
4		5		6		7					
92	guilty	S-H(G)	83	amazed	S-S	82	bashful	S-H(S)	58	revulsion	D-R
79	blameworthy	S-H(G)	72	surprised	S-S	79	sheepish	S-H(S)	36	disgusted	D-R
52	contemptuous	C-S	71	astonished	S-S	57	shy	S-H(S)	-33	downhearted	D-A
45	scornful	C-S	41	attentive	I-E	34	disdainful	C-S	32	amazed	S-S
44	cistaste	D-R	34	concentrating	I-E				31	discouraged	D-A
37	sad	D-A	30	disgusted	D-R						
35	revulsion	D-R									
31	shy	S-H(S)									

Table X.13
Matrix: Combined Data

	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
101	1																				
102		1																			
103			1																		
104				1																	
105					1																
106						1															
107							1														
108								1													
109									1												
110										1											
111											1										
112												1									
113													1								
114														1							
115															1						
116																1					
117																	1				
118																		1			
119																			1		
120																				1	

121
122
123
124
125
126
127
128
129
130

131
132
133

The image contains a series of vertical columns of data, likely representing a table or a list of records. The columns are numbered 121 through 133. Each column contains a sequence of characters, possibly representing a code or a set of coordinates. The characters are arranged in a regular grid pattern, with some columns appearing to have more data than others. The overall appearance is that of a technical document or a data dump.

Table X.14
Table of Principal Factors: Combined Data

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
I01	.93423	1	11.59925	35.1	35.1
I02	.91359	2	15.42010	46.4	81.6
I03	.94301	3	2.75830	8.4	90.0
I04	.87374	4	2.16423	6.5	96.5
I05	.82151	5	2.02403	6.1	102.6
I06	.85661	6	1.28292	3.9	106.5
I07	.89686	7	1.25831	3.8	110.3
I08	.92632	8	.98390	3.0	113.3
I09	.96208	9	.75186	2.3	115.6
I10	.93343	10	.50769	1.5	117.1
I11	.94475	11	.46921	1.4	118.5
I12	.96788	12	.42701	1.3	119.8
I13	.97279	13	.36829	1.1	120.9
I14	.96841	14	.34830	1.1	122.0
I15	.95124	15	.27716	.8	122.8
I16	.95133	16	.22446	.7	123.5
I17	.86982	17	.18750	.6	124.1
I18	.96557	18	.17233	.5	124.6
I19	.96130	19	.16223	.5	125.1
I20	.93261	20	.14999	.5	125.6
I21	.93569	21	.10903	.3	125.9
I22	.95745	22	.08317	.3	126.2
I23	.93581	23	.08045	.2	126.4
I24	.93041	24	.05938	.2	126.6
I25	.95617	25	.04854	.1	126.7
I26	.91163	26	.04291	.1	126.8
I27	.91339	27	.03076	.1	126.9
I28	.88881	28	.02442	.1	127.0
I29	.95001	29	.02028	.1	127.1
I30	.88257	30	.01299	.0	127.1
I31	.91669	31	.00915	.0	127.1
I32	.95297	32	.00537	.0	127.1
I33		33		.0	127.1

Rotated Factor Structure o

	1		2		3		4	Rotated			
86	enraged	A-R	91	alert	I-E	83	fatigued	F-S	84	joyful	E-J
46	angry	A-R	84	concentrating	I-E	77	sluggish	F-S	81	happy	E-J
81	sad	D-A	78	attentive	I-E	57	sleepy	F-S	65	delighted	E-J
76	discouraged	D-A	46	astonished	S-S	49	sheepish	S-H(S)	45	attentive	I-E
75	afraid	F-T	43	amazed	S-S	49	disdainful	C-S	-42	distaste	D-R
73	scornful	C-S	33	fearful	F-T	43	repentant	S-H(G)	31	astonished	S-S
73	mad	A-R	31	delighted	E-J	42	blameworthy	S-H(G)			
69	revulsion	D-R	31	disdainful	C-S	32	contemptuous	C-S			
68	disgusted	D-R				32	sad	D-A			
65	fearful	F-T									
62	scared	F-T									
47	downhearted	D-A									
43	disdainful	C-S									
41	contemptuous	C-S									
41	repentant	S-H(G)									
41	sleepy	F-S									
-34	delighted	E-J									

Note. Decimal points omitted.

^aOnly values ≥ 30 have been included.

Table X.15

Rotated Factor Structure of DES: Combined Data from Curiosity Type x Intensity Situations

Rotated Factors ^a											
4			5			6			7		
84	joyful	E-J	70	guilty	S-H(S)	79	surprised	S-S	86	bashful	S-H(S)
81	happy	E-J	64	distaste	D-R	67	amazed	S-S	79	shy	S-H(S)
65	delighted	E-J	59	blameworthy	S-H(G)	57	astonished	S-S	43	sheepish	S-H(S)
45	attentive	I-E	58	contempt	C-S	42	downhearted	D-A	32	disgusted	D-R
-42	distaste	D-R	54	repentant	S-H(G)	34	distaste	D-R	30	sad	D-A
31	astonished	S-S	36	disdainful	C-S	33	repentant	S-H(G)			
			34	scornful	C-S						
			32	enraged	A-R						
			32	fearful	F-T						
			32	sheepish	S-H(S)						
			31	revulsion	D-R						

APPENDIX Y
ALPHA COEFFICIENTS FOR DES SUBSCALES

Table Y.1
Alpha Coefficients for DES Subscales

Emotion	Situations			
	High Depth	Low Depth	High Breadth	Low Breadth
I-E	86	93	83	90
E-J	86	87	85	93
S-S	79	85	89	85
F-T	96	82	91	90
D-R	74	42	a	65
S-H(G)	82	53	26	70
D-A	83	60	51	76
C-S	70	71	40	84
S-H(S)	69	29	75	79
A-R	90	87	a	94
F-S	69	59	24	66

Note. Decimal points omitted.

^aOne of the three items had insufficient variance ($\underline{M} = 1$, $\underline{SD} = 0$).

APPENDIX Z

CORRELATIONS BETWEEN REPEATED MEASURES FOR 2 X 2 FACTORIAL

Table Z.1 Correlations between Repeated Measures for
2 x 2 Factorial: Interest-Excitement

Table Z.2 Correlations between Repeated Measures for
2 x 2 Factorial: Enjoyment-Joy

Table Z.3 Correlations between Repeated Measures for
2 x 2 Factorial: Surprise-Startle

Table Z.4 Correlations between Repeated Measures for
2 x 2 Factorial: Fear-Terror

Table Z.1
 Correlations between Repeated Measures^a for 2 x 2 Factorial:
 Interest-Excitement

Breadth of Interest Trait	Depth of Interest Trait							
	HIGH				LOW			
	1	2	3	4	1	2	3	4
HIGH	1							
	2	33			-16			
	3	43	-34		02	52		
	4	-08	03	42	-56	-46	18	
		(n = 11)				(n = 7)		
LOW	1							
	2	41			12			
	3	71	32		77	37		
	4	41	10	44	-18	-17	30	
		(n = 11)				(n = 8)		

Note. Decimal points omitted.

- ^a₁ = high depth curiosity situation.
₂ = low depth curiosity situation.
₃ = high breadth curiosity situation.
₄ = low breadth curiosity situation.

Table Z.2
 Correlations between Repeated Measures^a for 2 x 2 Factorial:
 Enjoyment-Joy

Breadth of Interest Trait	Depth of Interest Trait							
	HIGH				LOW			
	1	2	3	4	1	2	3	4
HIGH	1							
	2	79			-24			
	3	20	18		-58	24		
	4	47	67	01	-47	19	54	
		(n = 11)				(n = 8)		
LOW	1							
	2	95			53			
	3	48	46		21	-46		
	4	57	48	36	-35	-64	42	
		(n = 11)				(n = 8)		

Note. Decimal points omitted.

- ^a₁ = high depth curiosity situation.
₂ = low depth curiosity situation.
₃ = high breadth curiosity situation.
₄ = low breadth curiosity situation.

Table Z.3
 Correlations between Repeated Measures^a for 2 x 2 Factorial:
 Surprise-Startle

Breadth of Interest Trait	Depth of Interest Trait							
	HIGH				LOW			
	1	2	3	4	1	2	3	4
HIGH	1							
	2	70			-31			
	3	71	22		-14	40		
	4	09	06	35		-33	53	86
		(n = 11)				(n = 8)		
LOW	1							
	2	56			-12			
	3	54	52		-24	-26		
	4	48	82	12		-18	-67	53
		(n = 11)				(n = 8)		

Note. Decimal points omitted.

- ^a₁ = high depth curiosity situation.
₂ = low depth curiosity situation.
₃ = high breadth curiosity situation.
₄ = low breadth curiosity situation.

Table Z.4
Correlations between Repeated Measures^a for 2 x 2 Factorial:
Fear-Terror

Breadth of Interest Trait	Depth of Interest Trait							
	HIGH				LOW			
	1	2	3	4	1	2	3	4
HIGH	1							
	2	40			12			
	3	18	-32		69	04		
	4	51	-12	41	07	42	-32	
		(n = 11)				(n = 8)		
LOW	1							
	2	-18			-26			
	3	-15	11		27	-36		
	4	22	38	29	-25	-22	24	
		(n = 11)				(n = 8)		

Note. Decimal points omitted.

- ^a₁ = high depth curiosity situation.
₂ = low depth curiosity situation.
₃ = high breadth curiosity situation.
₄ = low breadth curiosity situation.